A STUDY OF THE ACHIEVEMENT IN READING AND ARITHMETIC OF A SELECTED SAMPLE OF JUVENILE DELINQUENT BOYS

BOSTON UNIVERSITY

SCHOOL OF EDUCATION

Thesis

A STUDY OF THE ACHIEVEMENT IN READING AND ARITHMETIC OF A SELECTED SAMPLE OF JUVENILE DELINQUENT BOYS

Submitted by

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(B.S. in Ed., Boston University School of Education, 1941)

In partial fulfillment of requirements for
the degree of Master of Education

1948

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Acknowledgements

The writer wishes to express his appreciation to Judge John Connolly, Judge of the Boston Juvenile Court, whose cooperation made possible the procurement of data for this study; and to Dr. William C. Kvaraceus, Associate Professor of Education, School of Education, Boston University, for his assistance in planning and in carrying out this study.

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STATEMENT OF PROBLEM AND SCOPE OF THE STUDY

CHAPTER I

I. THE PROBLEM

This study is an attempt to determine the achievement in reading and in arithmetic of a selected sample of two hundred juvenile delinquent boys.

In this study, "retardation" will be used to denote the failure of an individual to achieve up to his capacity. The term "juvenile delinquent" is a legal term applied only to those youths who are known to have violated a law or ordinance, and have been acted upon in some type of court.

II. SCOPE OF THE STUDY

This study is based upon the case records of 200 boys who, because of various misdemeanors, have appeared in Boston Juvenile Court. The boys in this study include those in the 11-16 chronological age group who have been referred by the Juvenile Court between the years 1943-1947 to the Citizenship Training Group,[1] a youth organization, on Boylston Street, Boston.

The reading and arithmetic level of each boy has been determined by the Stanford Achievement Test, Advanced Battery, Form G; while the intelligence quotients have been computed by three tests: Dearborn Test of Intelligence, Form C; Terman-McNemar Intelligence Test, Form A; and the Wechsler-Bellevue Intelligence Test. Pertinent information can be secured from these three intelligence tests, since the Dearborn Test is one of general intelligence, the Terman-McNemar Test stresses academic ability, while the Wechsler-Bellevue Test, in addition to a total intelligence quotient, gives both a verbal score and a performance score. Each of these tests was administered by a competent clinical psychologist when each boy was taken into custody by the courts.

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[1] Wollan, Kenneth I., and Gardner, George E., "A Group Clinic Approach to Delinquency," Mental Hygiene, 22: 567-584, October 1938

CHAPTER II

JUSTIFICATION AND BACKGROUND

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The inability to succeed in studies is found to coexist as one of the many inefficiencies of juvenile delinquents. As stated by Cyril Burt,[1]

> Nothing is so startling about the juvenile delinquent as his extraordinary lack of knowledge; it is with him and with his kind, more frequent and more profound than any other intellectual failing. He is ignorant alike in the narrower respect of the simpler scholastic subjects--reading, writing, and arithmetic--and in all the wider spheres of ordinary information and culture....The majority of criminal children are indubitably backward. The educational ratio of the juvenile delinquent is 81. At every stage he is far more behind in knowledge than in capacity.

Since reading difficulties have been listed as one of the leading causes of failure in school work, information regarding the extent to which reading retardation is present in cases of juvenile delinquency among boys should be of value to teachers and others interested in the juvenile delinquent.

Today, with educators interested in the development of the whole child, and with an increasing emphasis upon the term "individual differences," much attention is being focused on the maladjusted pupil in the classroom. Provisions, which have as their ultimate objective the prevention of maladjustment, are being made for individual differences as they are found to exist.

Current literature stresses the increase in the amount of juvenile delinquency. Keener[2] in writing of the role of the classroom teacher in relation to delinquency, states that "treatment is necessary, but prevention is both more economical and more effective." Gates[3] in 1936 warned, "there

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1. Cyril Burt, The Young Delinquent, New York, D. Appleton-Century Co.,1938, p. 321-322
2. Edward B. Keener, "Classroom Teacher and Juvenile Delinquency" Elementary School Journal, 40:55, September, 1939
3. Arthur I. Gates, "Failure in Reading and Social Maladjustment" Journal of National Education Association, 25: 205, October 1936

is much evidence that failure in school is a major catastrophe to many children, and that general maladjustment is a consequence." Hill[1] in commenting on the increase in juvenile delinquency and its relationship to the school situation, asks the question "have the schools done all they could do in preventing and correcting anti-social tendencies in young children and adolescents?"

Society is being continually impressed, as the literature shows, with the increase in delinquency. At the same time, people and organizations concerned with the problem of the juvenile delinquent are focusing their attention away from home and heredity as the only causes of delinquency, and are including the schools in their survey for factors which contribute to delinquency.

As a result of this new interest in youth's adjustment to school and academic training, recent studies stress the importance of school failure in the picture of the juvenile delinquent. A statement by Lane and Witty[2] may be used to emphasize the need for more concentration on the educational status of pupils in the schools when studying the delinquency problem.

> Although many studies have been published concerning the mental status of the delinquent, few comprehensive investigations of the educational status of the youthful offender have been concerned and effected. However, in the research for the provenance of delinquent behavior, the role of the school is repeatedly and increasingly emphasized. In a study of 636 delinquent boys entering St. Charles, Illinois, School for Boys, it was found that the boys had a median C.A. of 14 and 5.6 months. The median mental age on the Otis Test was 12 and 9.4 months; and the median I.Q. was 88.25. Based on the results of the Stanford Achievement Test, the median educational age was 11.6. In studying the scores attained by these boys upon the Stanford Achievement Test, the median grade equivalents were found:

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1. George E. Hill, "Fewer Schools--More Jails," Education, 55: 558-561, May 1935
2. Howard H. Lane, and Paul A. Witty, "The Educational Attainment of Delinquent Boys," Educational Psychology, 25:695, Dec. 1934

Test	grade
Paragraph meaning	5.7
Word Meaning	6.0
Total Reading	5.85
Arithmetic Computation	5.1
Arithmetic Reasoning	6.4
Total Arithmetic	5.7

> This study suggests the significant role which educational retardation plays in the lives of the delinquent boys. Although mental retardation characterized the group, it was much less noticeable and grave than was retardation in educational growth. One may reasonably infer that the low, but improvable, educational status of delinquent children is an important element in producing discontent, and in engendering a-social behavior. One may assume further that improvement in educational opportunity--with adaptation of materials and methods of instruction to individual differences in ability and interests--may ameliorate somewhat the conditions that foster maladjustment and contribute to delinquent behavior.

Hill[1] lays stress to the importance of the educational status of delinquent boys in his study in which he describes the educational attainment of young male offenders over 16 years of age who were, at the time of the study, inmates of the State Reformatory at Pontiac, Illinois.

> Relatively few boys had schooling beyond the traditional eight grades. The median grade completed was Grade VII. The median offender was retarded at least one year in school. The grade level of achievement (on the Stanford Achievement Test) of the median delinquent boy was, in all tests but three, below his level of grade attainment in school progress. The range in educational ages was from 5.7 to 19.2, with a median of 12.6 years. The range in educational quotients was from 24 to 123, the median being 77.6. The median scores and grade levels on the Stanford Achievement Test made by 1500 male offenders over 16 years of age:

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1. George E. Hill, "Educational Attainments of Young Male Offenders," Elementary School Journal, 36: 53, September, 1935

Test	Median score	Grade level
Paragraph meaning	80.5	6.8
Word meaning	85.3	7.4
Total reading	82.9	7.0
Arithmetic reasoning	86.7	7.6
Arithmetic computation	66.9	5.4
Total arithmetic	72.8	6.5
Complete test	79.0	6.6

Retardation, failure, lack of interest, and poor adjustment to the school situation are outstanding characteristics of the school experiences of these young men.

In raising the question, "Delinquency--A By-Product of the School?", Kvaraceus[1] states:

> Juvenile delinquency is a frequent form of aggressive behavior among frustrated youth. A search for 'causes' or 'predisposing factors' should therefore result in a search for situations that frustrate.
>
> The school has never been adequately explored for its subsequent effects upon childhood behavior--good or bad. That the school could actually predispose or even 'cause' delinquent behavior through frustrating experiences within the school is a premise which many school people find difficult to accept.
>
> In a study of 761 delinquents, 563 boys and 198 girls, handled by the Passaic Children's Bureau during the past five years, the mean IQ for the delinquent group was found to be 89 (S.D. 14.5) in contrast to the mean IQ of 103 (S.D. 10.7) for the general school population. Since the school program remains essentially academic in nature, the delinquents who showed, on the average, limited facility for getting learning out of books, must find the daily school experience full of frustrations and dissatisfactions. Other data lend weight to this interpretation.
>
> Forty-four per cent of all delinquents repeated one term (half year) or more. Twenty per cent of the male delinquents and thirty-eight per cent of the female delinquents repeated three or more terms.

McElwee[2] makes mention of reading retardation as a factor in truancy and ultimate delinquency when she states:

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1. W.C.Kvaraceus, "Delinquency--A By-Product of the School?", School and Society, p 350-351, May 13, 1944
2. E.W.McElwee, "A Study of Truants and Retardation," Journal of Juvenile Research, 13: 209, July, 1931

> A study was made of some truants whose cases were heard in court during 1929-1930. The median truant was two terms retarded in grade placement, his reading attainment three terms below that of the average child in his grade, yet, considering his mental age, he was reading material two terms advanced beyond what would be expected of him. The explanation of truancy seems self-evident. No wonder the truant does not find school interesting. The work of his grade is too difficult for him. Truancy is his escape from an embarrassing and unpleasant situation.

As further proof of the existence of a definite relationship between school retardation and delinquency is the study conducted by Sheldon and Eleanor Glueck[1]. Of school retardation they say

> Another important factor in juvenile delinquency is that of school retardation which is related not only to the mental make-up of our juvenile delinquents, but also to their school attendance and behavior, and to the great mobility of their families. Of 935 cases in which the extent of school retardation was known, only 145 boys (15.5%) were not retarded in school; 219 (23.4%) were retarded one year; 261 (27.9%) two years; 228 (24.4%) three or more years; and 82 (8.8%) were in ungraded classes. Thus, a total of 790 juveniles (84.5%) were at least one year behind grade in their school work.

From this study we note that these boys as a group were considerably more retarded than the general school population. Only one-seventh of the delinquent boys were of normal school standing for their age, and nearly one-fourth were retarded three or more years. Although the Gluecks do not list the amount of retardation, it can be assumed that since reading is a fundamental tool in learning, reading retardation was common in this group of boys.

Healey and Bronner[2] show the relationship between reading disability and school failure when they report:

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1. Sheldon Glueck and Eleanor Glueck, One Thousand Juvenile Delinquents. Cambridge: Harvard University Press
2. William Healy, M.D., and Augusta F. Bronner, "How Does the School Produce or Prevent Delinquency?" Journal of Educational Sociology, 6:450-470, April, 1933

> Most important for school success in modern life, with the subordination of manual accomplishments and arts to facility with abstractions and symbols, is the ability to read well. This leads to the fact that reading disability brings in its train a host of failures and the consequent development of unfortunate emotional attitudes, whether the disability be with the mechanics or with the comprehension of reading. Just now in a few centers in this country there is a lively awakening to the extreme importance of reading disability and the necessity of special remedial training. Its relationship to antisocial conduct can be readily understood.

One of the few available studies which concerns reading retardation and the juvenile delinquent is that by Edward H. Stullken[1]. This study is based on the records of the Montefiore School which is conducted for maladjusted boys by the Chicago Board of Education. Concerning reading retardation, Stullken states:

> Approximately twenty per cent of all boys who enter Montefiore School have severe reading disabilities. Over ninety per cent of all problem boys (between the ages 12-16 years) studied in the Montefiore School are retarded one or more years below the level at which they should be reading according to their chronological age. Furthermore, approximately sixty-six per cent are retarded one or more years in reading below the level of their mental ages.
>
> The sense of differences is strong in children and the source of much conflict when the differences are not in their favor. The ordinary classroom is organized often on a competitive basis that does not give a fair field to the child who is retarded in reading, and it seems quite logical that he should become indifferent to school and develop characteristics of truancy and poor behavior that make him a problem case.

From the above studies we see that the inability to succeed in classroom work is found to coexist as one of the many factors in the history of the juvenile delinquent. We have stated that information regarding the extent to which retardation is present in cases of juvenile delinquency among boys should be of value to teachers and others interested in the

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1. Edward H. Stullken, "Retardation in Reading and the Problem Boy in School," Elementary English Review 14: 179-182, May, 1937

juvenile delinquent. Such information should also be of value to educational departments of correctional institutions who are receiving juvenile delinquents sent to these institutions. Probation officers, social workers, youth agencies who are working with problem boys, and Departments of Mental Health who are continually confronted with cases of maladjustment in school and in their child guidance clinics, should find this information of value.

RECAPITULATION

This study is an attempt to determine the achievement in reading and in arithmetic of a selected sample of two hundred juvenile delinquent boys.

CHAPTER III

DESCRIPTION AND ANALYSIS OF DATA

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The purpose of this study is to determine, from available data, the achievement in reading and in arithmetic of a selected sample of juvenile delinquent boys. The study is based on the case records of two hundred boys between the ages of 11-16 who, because of the violation of a law or an ordinance, have been referred by the Boston Juvenile Court to the Citizenship Training Group, and organization for youthful offenders in Boston, Massachusetts.

The two hundred cases in this study have been chosen from the files of the Citizenship Training Group in the following manner. Beginning with the most recent case record filed in 1947, and working back to the year 1943 (a five-year period) every record that met the following criteria was included in the study:

1. Chronological age at the time of testing
2. School grade at the time of testing
3. Scores on the Stanford Reading Tests
4. Scores on the Stanford Arithmetic Tests
5. Scores on the Dearborn Intelligence Test

Because of the specified data needed for each boy in this study, the two hundred cases that make up this study are all that are available with complete data from a total of 405 case records. The difference in scores which might be attributed to a variation in testing techniques would not be significant, since all testing was done by one trained clinical psychologist.

The following tables are descriptive of the boys from which the data for this study has been gathered.

TABLE I

DISTRIBUTION OF CHRONOLOGICAL AGES

OF THE 200 JUVENILE DELINQUENTS FROM THE CITIZENSHIP TRAINING GROUP

C.A. in years	Frequency
11-12	7
12-13	24
13-14	42
14-15	60
15-16	51
16-17	16
Mean	14.4
S.D.	1.3
$S.E._m$	.092
N	200

Table I shows the distribution of chronological ages of the two hundred juvenile delinquent boys in this study. The boys' ages range from 11.0 to 16.10 years, with sixty-eight per cent of the boys falling between the ages of 13.2 and 15.7.

TABLE II

DESCRIPTION OF INTELLIGENCE QUOTIENTS FOR 200 JUVENILE DELINQUENT BOYS, ON THE DEARBORN INTELLIGENCE TEST

I.Q. Scores	Frequency
60-69	4
70-79	8
80-89	27
90-99	54
100-109	63
110-119	30
120-129	11
130-139	2
140-149	1

Mean	100.2
S.D.	12.6
$S.E._m$	0.887
N	200

Table II shows the distribution of the intelligence quotients of the boys in this study. The mean I.Q. is 100.2, with sixty-eight per cent of the scores falling within the 90-119 range.

TABLE III

DESCRIPTION OF MENTAL AGES FOR 200

JUVENILE DELINQUENT BOYS ON THE DEARBORN INTELLIGENCE TEST

M.A.	Frequency
8.0-8.11	5
9.0-9.11	4
10.0-10.11	11
11.0-11.11	13
12.0-12.11	25
13.0-13.11	37
14.0-14.11	44
15.0-15.11	28
16.0-16.11	21
17.0-17.11	12

Mean	14.0
S.D.	2.5
$S.E._m$	1.78
N	200

Table III shows the distribution of mental ages of the two hundred juvenile delinquent boys in this study. The mental ages range from 8.0 to 17.11, with sixty-eight per cent of the group falling between the ages of 12.0 and 16.0.

TABLE IV

DISTRIBUTION OF THE GRADE LEVEL OF THE 200 JUVENILE DELINQUENT BOYS AT THE TIME OF TESTING--BASED ON SCHOOL RECORDS

Grade level	Frequency
4.0-4.10	3
5.0-5.10	6
6.0-6.10	32
7.0-7.10	46
8.0-8.10	44
9.0-9.10	46
10.0-10.10	17
11.0-11.10	5
12.0-12.10	1

Mean	7.8
S.D.	1.3
$S.E._m$	0.894

Table IV shows the distribution of the grade placement of the two hundred juvenile delinquent boys at the time of testing. The grade levels are based on school records. The mean grade-level is 7.8, with sixty-eight per cent of the group falling within the 6.3 and 9.5 grade levels.

TABLE V

COMPARISON OF INTELLIGENCE QUOTIENTS DERIVED FROM DEARBORN, TERMAN-McNEMAR, AND WECHSLER-BELLEVUE TESTS

	NO.	MEAN	S.D.	$S.E._M$	DIFF	$S.E._D$	CRITICAL RATIO
DEARBORN I.Q.	188	103.5	13.50	1.0	15.1	1.4	10.780
TERMAN-McNEMAR I.Q.	188	88.4	14.00	1.0			
DEARBORN I.Q.	60	100.7	23.30	3.0	6.2	3.2	1.876
WECHSLER-BELLEVUE PERFORMANCE I.Q.	60	94.5	11.0	1.4			
DEARBORN I.Q.	60	100.7	23.30	3.0	11.2	3.4	3.294
WECHSLER-BELLEVUE	60	89.5	11.80	1.5			
DEARBORN I.Q.	60	100.7	23.30	3.0	11.2	3.3	3.393
TOTAL WECHSLER-BELLEVUE I.Q.	60	89.5	11.20	1.4			
TERMAN-McNEMAR I.Q.	55	84.5	13.80	1.9	10.0	2.3	4.249
WECHSLER-BELLEVUE PERFORMANCE I.Q.	55	94.5	11.10	1.4			
TERMAN-McNEMAR I.Q.	55	84.5	13.80	1.9	5.0	2.5	1.961
WECHSLER-BELLEVUE VERBAL I.Q.	55	89.5	12.50	1.7			
TERMAN -McNEMAR I.Q.	55	84.5	13.80	1.9	5.0	2.4	2.083
TOTAL WECHSLER-BELLEVUE I.Q.	55	89.5	11.10	1.5			

Table V indicates statistical information pertaining to the intelligence quotients derived from the Dearborn Intelligence Test, the Terman-McNemar Intelligence Test, and the Wechsler-Bellevue Intelligence Test.

In order to judge the statistical significance of differences in this thesis, the criteria of 3.0[1] shall be used.

Statistically significant differences were found between the Dearborn I.Q. and the Terman-McNemar I.Q. (10.780), between the Dearborn I.Q. and the Total Wechsler-Bellevue I.Q. (3.393), between the Dearborn I.Q. and the Wechsler-Bellevue Verbal I.Q. (3.294), and between the Terman-McNemar I.Q. and the Wechsler-Bellevue Performance I.Q. (4.249).

No statistically significant differences were found between the Dearborn I.Q. and the Wechsler-Bellevue Performance I.Q. (1.876), between the Terman-McNemar I.Q. and the Total Wechsler-Bellevue I.Q. (2.083), and between the Terman-McNemar I.Q. and the Wechsler-Bellevue Verbal I.Q. (1.961).

In comparing the Dearborn I.Q's with the Terman-McNemar I.Q.'s on 188 of the 200 boys in the study, a critical ratio of 10.780 is found. This is statistically significant. Since the critical ratio is more than 3.0, the chances are better than 99.7% in 100 that this represents a true difference.

In comparing the Dearborn I.Q.'s with the Wechsler-Bellevue Verbal I.Q.'s, and with the total I.Q. on the Wechsler-Bellevue, critical ratios of 3.294 and 3.393 are found. The difference in each case is statistically significant. The chances are better than 99.7% in 100 that this represents a true difference.

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1. John Gray Peatman, Descriptive and Sampling Statistics, Harper and Brothers, New York, 1947, p. 366-367

In comparing the Terman-McNemar I.Q. with the Wechsler-Bellevue Performance I.Q., a critical ratio of 4.249 is found. The difference is statistically significant, with the chances being better than 99.7% in 100 that this represents a true difference.

TABLE VI

COMPARISON OF CHRONOLOGICAL AGES WITH MENTAL AGES

DERIVED FROM THE DEARBORN AND TERMAN-McNEMAR INTELLIGENCE TESTS

	NO.	MEAN	S.D.	$S.E._M$	DIFF	$S.E._D$	CRITICAL RATIO
C.A.	200	14.4	1.3	0.90	0.4	0.21	1.988
DEARBORN M.A.	200	14.0	2.5	0.18			
C.A.	188	14.0	1.5	0.11	1.4	0.27	5.185
TERMAN-McNEMAR M.A.	188	12.8	3.4	0.25			

The above table shows a comparison of the chronological ages with the mental ages derived from the Dearborn Intelligence Test and the Terman-McNemar Intelligence Test.

The critical ratio in the Dearborn Test (1.988) indicates that the chances are less than 95 in 100 that this represents a true difference.

In the Terman-McNemar Test, since the critical ratio of 5.185 is greater than 3.0, this is a statistically significant difference.

TABLE VII

READING AND ARITHMETIC AGE LEVELS COMPARED

WITH MENTAL AGES DERIVED FROM DEARBORN INTELLIGENCE TEST

	NO.	MEAN	S.D.	$S.E._M$	DIFF	$S.E._D$	CRITICAL RATIO
DEARBORN M.A.	200	14.0	2.5	0.18	2.0	0.25	8.000
READING AGE	200	12.0	2.4	0.17			
DEARBORN M.A.	200	14.0	2.5	0.18	2.8	0.21	13.610
ARITHMETIC REASONING	200	11.2	1.7	0.12			
DEARBORN M.A.	200	14.0	2.5	0.17	3.3	0.22	14.925
ARITHMETIC COMPUTATION	200	10.6	1.9	0.13			
DEARBORN M.A.	200	14.0	2.5	0.18	3.2	0.22	14.419
TOTAL ARITHMETIC	200	10.8	1.9	0.13			

The above table shows the comparison between the Dearborn Intelligence Test Mental Age and the reading and arithmetic ages attained on the Stanford Achievement Test, when each test was administered to the same population. All of these differences are statistically significant.

The critical ratios of 8.000, 13.610, 14.925, and 14.419, show that the chances are better than 99.7% that a true difference is represented.

TABLE VIII

READING AND ARITHMETIC AGE LEVELS COMPARED

WITH MENTAL AGES DERIVED FROM TERMAN-McNEMAR INTELLIGENCE TEST

	NO.	MEAN	S.D.	$S.E._M$	DIFF	$S.E._D$	CRITICAL RATIO
TERMAN M.A.	188	12.8	3.4	0.25	0.4	0.341	1.297
READING AGE	188	13.0	2.4	0.18			
TERMAN M.A.	188	12.8	3.4	0.25	0.3	0.291	1.030
ARITH. REASONING	188	12.5	2.1	0.15			
TERMAN M.A.	188	12.8	3.4	0.25	0.3	0.212	1.053
ARITH. COMPUTATION	188	12.5	1.9	0.14			
TERMAN M.A.	188	12.8	3.4	0.25	0.3	0.212	1.053
TOTAL ARITHMETIC	188	12.5	1.9	0.14			

The above table shows the comparison between the Terman-McNemar Mental Age and the reading and arithmetic ages attained on the Stanford Achievement Test when each test was administered to the same population. None of these differences is statistically significant.

The critical ratio between the Terman-McNemar M.A. and the reading age in 188 of the 200 cases in this study is 1.297. The chances are less than 77 in 100 that this is a true difference.

The critical ratio between the Terman-McNemar M.A. and the arithmetic reasoning age in the same 188 cases is 1.030. The chances are less than 69 in 100 that this represents a true difference.

The critical ratio between the Terman-McNemar M.A. and the arithmetic computation age in the 188 cases is 1.053. The chances are less than 71 in

100 that this represents a true difference.

The critical ratio between the Terman-McNemar M.A. and the total arithmetic age in the 188 cases is 1.053. The chances are less than 71 in 100 that this represents a true difference.

In Table VIII it is noted that the mean subject age in each test is much nearer the mean M.A. on the Terman-McNemar Intelligence Test. It may be assumed that the mean subject age is higher in this case because the Terman-McNemar Test is more of an academic nature, and is more of a reading test than is either the Dearborn or the Wechsler-Bellevue Intelligence tests.

TABLE IX

READING AND ARITHMETIC AGE LEVELS

COMPARED WITH CHRONOLOGICAL AGE OF 200 JUVENILE DELINQUENT BOYS

	NO.	MEAN	S.D.	S.E. M	DIFF	S.E. D	CRITICAL RATIO
C.A.	200	14.4	1.3	0.09	2.4	0.19	12.631
READING AGE	200	12.0	2.4	0.17			
C.A.	200	14.4	1.3	0.09	3.2	0.15	21.333
REASONING AGE	200	11.2	3.6	0.12			
C.A.	200	14.4	1.3	0.09	3.9	0.14	27.464
COMPUTATION AGE	200	10.7	1.9	0.13			
C.A.	200	14.4	1.3	0.09	3.6	0.16	22.378
TOTAL ARITH. AGE	200	10.10	1.9	0.13			

The above table shows the comparison between the chronological age of the 200 juvenile delinquent boys and the age equivalent of these boys in reading and arithmetic, as determined by the Stanford Achievement Test.

Each of these differences is statistically significant.

The critical ratio between the chronological age and the age in arithmetic reasoning is 21.333. The critical ratio between chronological age and arithmetic computation is 27.464. The critical ratio between chronological age and the age level in total arithmetic is 22.378. In each case the chances are better than 99.7/ in 100 that this represents a true difference.

TABLE X

COMPARISON BETWEEN SCHOOL GRADE AND

GRADE LEVEL OF ACHIEVEMENT IN READING AND ARITHMETIC

	NO.	MEAN	S.D.	$S.E._M$	DIFF	$S.E._D$	CRITICAL RATIO
SCHOOL GRADE	200	7.8	1.3	0.09	0.1	0.17	0.5882
READING GRADE	200	7.7	2.0	0.14			
SCHOOL GRADE	200	7.8	1.3	0.09	1.6	0.12	13.333
ARITHMETIC REASONING GRADE	200	6.2	1.1	0.08			
SCHOOL GRADE	200	7.8	1.3	0.09	2.2	0.14	15.714
ARITH. COMPUTATION GRADE	200	5.6	1.6	0.11			
SCHOOL GRADE	200	7.8	1.3	0.09	1.9	0.14	13.571
TOTAL ARITHMETIC	200	5.9	1.6	0.11			

The above table shows the comparison between the school grade of the 200 juvenile delinquent boys and the reading and arithmetic grade-equivalents based on scores on the Stanford Achievement Test.

The critical ratio between the school grade and the reading grade is 0.5882. This is not statistically significant. The chances are 43 in 100 that this represents a true difference.

The critical ratios between the school grade and the grade levels in arithmetic reasoning (13.333), computation (15.714), and total arithmetic (13.571), are statistically significant. The chances are better than 99.7 in 100 that a true difference is represented in each case.

CHAPTER IV

CONCLUSIONS

and

NEEDED RESEARCH

CHAPTER IV

CONCLUSIONS AND NEEDED RESEARCH

This study is made to determine the amount of achievement made by 200 selected juvenile delinquent boys in reading and arithmetic.

The boys, who are in the 11-16 chronological age group, have a mean chronological age of 14.4 (S.D. 12.5) and a mean school grade of 7.8 (S.D. 1.3).

The results of three intelligence tests: the Dearborn Intelligence Test, Form C, the Terman-McNemar Test, Form C, and the Wechsler-Bellevue Test have been used in this study. Age and grade achievement in reading and in arithmetic have been determined from scores on the Stanford Achievement Test, Form G.

The results of this study show that these delinquent boys are retarded in reading and in arithmetic. Although the amount of retardation varies in each case, statistics show that the boys are retarded two years in reading, two years and nine months in arithmetic reasoning, and three years and three months in arithmetic computation.

When grade placement is considered, the facts of this study point out that the boys are retarded one year and one month in grade placement. They are retarded one year and two months in reading, two years and seven months in arithmetic reasoning, and three years and three months in arithmetic computation.

In addition to pointing out the existence of retardation in reading and in arithmetic, this study also emphasizes other facts which should be considered by educators in their selection of tests.

1. The Dearborn Intelligence Test and the Terman-McNemar test in the case of the 200 delinquent boys in this study, do not test the same areas. A comparison of scores made by the same boys on each test show the scores on the Dearborn test to be higher.

2. The Dearborn and the Wechsler-Bellevue Performance scores are similar; while the Terman-McNemar Intelligence quotient and the I.Q. on the Wechsler-Bellevue Verbal Test are not statistically different.

3. Since statistically significant differences are found when comparing the reading and arithmetic age levels with the mental ages derived from the Dearborn Intelligence Test; and since there is no statistically significant difference between the Terman-McNemar mental age and the age level of the boys in reading and arithmetic, it would seem, at least when working with boys whose intelligence quotients are similar to those of the boys in this study, that the Dearborn Intelligence Test is not so much a reading test as is the Terman McNemar Intelligence Test.

RESEARCH NEEDED

Since this study is based on a selected group of delinquent boys, further research may be made along the following lines:

1. Results from a larger population in which the random sampling technique may be used.

2. A study in which other factors, such as environment, economic and social conditions, complete school record, etc., may be studied to show the relationship that may exist between these factors and the school achievement of juvenile delinquents.

3. A parallel study based on a group of delinquent girls, to determine the achievement of delinquent boys and girls.

4. Studies of the achievement of juvenile delinquents within a specific age or grade level range would be of value to determine whether retardation is more noticeable at a particular age or grade level.

5. Additional studies might be made to determine to what extent retardation exists as a factor in the causation of juvenile delinquency.

6. A further study to determine whether juvenile delinquent boys are more retarded in arithmetic than in reading; and if the boys are more retarded in arithmetic than in reading, what factors contribute to this retardation.

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DEARBORN GROUP TESTS

SERIES II

Examinations C and D
For Grades IV to X

MANUAL

EDUCATIONAL TEST BUREAU, Inc.

Minneapolis - Nashville - Philadelphia

SERIES II
Examinations C and D

The Dearborn group tests of intelligence are arranged in two series: Series I and II. Series I is composed of General Examinations A and B and is designed for use in Grades I to III inclusive. Series II is composed of General Examinations C and D and is especially designed for use in Grades IV to X. inclusive. Series II may also be used for the testing of normal schools and college classes, and of other adult groups. The author has devised a special method applicable to these tests for the determination of the intelligence quotients of adults. It is described in the directions given in a following section for determining mental ages and intelligence quotients.

The general procedure for giving Series II is as follows: General Examination C should be given first, followed, after a convenient interval of at least a class period, by General Examination D. When the class attendance is regular, it is recommended that these examinations be given on separate days.

General Examination C can be given in about a half hour, and General Examination D in about thirty-five minutes.

The individual's score in either series is the *sum* of the credits on the two examinations. This combined score of the two examinations has been found, in general, to be more reliable than the score of either examination alone. The standard scores of Series II for the different chronological ages, with directions for calculating mental ages and intelligence quotients, are printed at the end of this manual, following the directions for scoring.

When it is desirable or necessary to devote less time to testing, General Examination A may be used as an abbreviated scale for Series I and General Examination C for Series II. Separate standards for General Examination C and for General Examination D are published on page 18.

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*The directions for giving and scoring the tests of Series I are published in a separate manual.

DIRECTIONS FOR THE EXAMINER

The following directions should be closely followed and the time limits of each test strictly adhered to in order to make a fair comparison with the standards possible.

To assure reliable results examiners should have some preliminary training in the giving of group tests, and should study carefully the directions for giving the tests. In order also to secure the necessary proficiency in giving the tests, it is a good plan to try them out first on a small group of teachers or of pupils selected for this purpose.

The regular teachers may give the tests, but when there are several grades or a whole school to be tested, it is usually better to select one or two persons, either the principal or teachers who are especially skillful in group work, to do the testing. The room teachers may then assist by entering the names and birthdays on the record sheets, but should not give any other assistance during the progress of the tests.

Either pencils or pen and ink may be used, but where ink is provided it is preferable to have all of the class use ink.

It is especially important that the birthdays, as given by the pupils on the title page, be checked from the class register or that they be entered accurately on the accompanying record sheet.

PRELIMINARY DIRECTIONS FOR GENERAL EXAMINATIONS C AND D

We are going to try some games and puzzles. Some of them are easy to do, and others harder. We should like to see how well and how many of them you can do.

Before we begin there are three general directions which we must all learn:

First, when I say *"Pens (or Pencils) up."* hold your pens up like this with the elbow resting on the desk. (Examiner shows how to lift the forearm only and rest the elbow on the desk to avoid fatigue.) When I say *"Go,"* put your pens on the paper, and when I say *"Stop,"* raise them again promptly. (Examiner should practice until class responds promptly.)

Secondly, do not look at any one else's paper.

Thirdly, if you finish before the time is called, hold your pens up for a moment to show that you have finished. *Distribute tests.*

DIRECTIONS FOR GIVING
GENERAL EXAMINATION C

When the papers are passed to you, please do not open them until you are told what to do. The first thing to do is to fill in the blanks at the top of the page. On the first line write your first and last name. Please write as well as you can, so that it can be easily read. Then write "boy" or "girl." Then where it says "AGE" write how old you are. Then give the date of your birth; first the *month,* then the *day* of the *month* and then the *year* in which you were born. (In the lower grades it is well to be sure that pupils know how to find the years of their births by subtracting their ages from the current year.) Now write your grade, the name of your school and city and the date.

I. Picture Sequences.

Now let us look at the pictures in the middle of this page here (pointing). There are two rows of pictures. Each row of pictures *across* the page will tell a story if the pictures are arranged in the right order. We are going to look at the pictures and put numbers on them to show the order in which they should come to tell the story. Now look at the first row of pictures across the page. There are four pictures and they tell a story of a letter which a little girl wrote to a little boy. Do you see the picture of the postman delivering a letter, then a boy reading a letter, then a girl mailing a letter, and, lastly, a girl writing a letter? Now, which of the four pictures should come first in the story? (Pause.) First, the little girl writes the letter, so that picture is marked number 1. Do you see the number 1 in the lower left-hand corner of the picture? Then she mails the letter, and so that picture is number 2. Next, the postman delivers the letter, so that is number 3. And then the boy gets the letter and reads it, so that picture is number 4.

Now look at this next row of pictures across the page. (Examiner should hold copy of test before class and point to the row across the page.) These four pictures will also tell a story if we arrange them in the right order. First, look carefully at each picture. Now which of them should come first to tell the story? "Kettle on stove." Write a large number 1 in the lower left-hand corner of the picture to show that you know that this picture comes first in the story. Which is next? "Maid bringing in the tea." Write a large number 2, in the lower left hand corner. Which is number 3? "Pouring of the tea."

Write a large number 3 in the lower left hand corner. Which picture comes next? "Drinking the tea." Put a large number 4 in the corner of this picture. Now you have the pictures in this row all numbered so that they tell a story.

Now turn this page over and you will find two pages of pictures. (Examiner should hold the pages up before the class and after making sure that all the pupils have the right pages, say *"Pencils (or Pens) up."*) Now when I say *"Go,"* I want you to look at each row of pictures, and write numbers on the pictures to show the order in which they should come in each row, so that each row of pictures will tell a story. Write the numbers in the lower left-hand corner of each picture. (Pointing.) There are four pictures in each row on the first page and five pictures in each row on the second page. When you finish the first page, go on to the next page. Ready, *"Go."* (Examiner will need to repeat directions to go on to the second page whenever he sees pupils stopping before time is called.)

Allow 6 minutes. *"Stop." "Pencils up."*

Now turn over the page again just as though you were turning the page of a book. If you did as I told you, you will have page 4. Look at the top of the page and see if it is numbered 4.

2. Word Sequences

"Pens (or Pencils) up." Look at the directions at the top of the page while I read them. "Number the following words to show their proper order. Put the numbers directly under the words as in the following examples." Look at the first example, dinner, supper, breakfast. The first meal is breakfast, so that is numbered 1. Dinner comes next, so that is numbered 2. Supper comes last, so that is numbered 3.

Look at the second example, B. Which of these four words should come first? Yes! First comes the seed, so that should be number 1. Write number 1 directly under the word "seed" to show that you know that this word should come first. From the seed grows the plant, so that is number 2. Write "2" under the word "plant." Then the flowers come on the plant, so "flowers" is number 3. Write number 3 under the word flower. And last of all comes the fruit, which is number 4. Write the "4" under it. *In each of the rows below write numbers directly under the words to show their proper order just as was done in the examples.* Ready, *"Go."*

Allow 6 minutes. *"Stop." "Pencils up."*

3. Form Completion

Now look at the figures down at the bottom of the page. First you will find four shaded figures or triangles numbered 1, 2, 3, and 4. These are supposed to be little blocks. Below these blocks there are some figures with blank and shaded spaces. The blank spaces in the figures are supposed to be empty places, and the shaded spaces are supposed to be covered with blocks. We want to show how the other blank spaces can be covered by using one or more of the four blocks. Now look at the first figure. It is already covered with blocks numbered 1 and 2. Look at the second figure. That is partly covered by block number 3. What *other* block can we put on it to cover it all up? Yes! Number 4. *Number 3 has already been used, so we will have to use number 4.* Put a figure 4 in the empty space to show that you could just cover the space with block number 4. Now, look at the next figure. Block number 4 is already on; what other block can we use to cover the empty space? (Either 1 or 2. Be sure that both these answers come from the class.) All right, write in the figure, either number 1 or 2, to show that you know which block you could use to cover the space. Now look at the fourth figure. (Examiner will draw the figure on the board.) Which blocks can we use to cover this figure? ("1 and 2, or 3 and 4." Whichever answer comes first accept it, and draw a line dividing the figure on the board into halves and write in the proper numbers.) How else could the figure be covered? (Also illustrate on board by drawing line and entering proper numbers.) All right, draw in one of the lines and write in the proper numbers to show which way you want to cover it. *"Pencils (or Pens) up."* Cover all the spaces that are left. *Draw in the lines just as we did on the board and put in the numbers to show which blocks you use.* There is one other direction: Do not use any block twice in the same figure. Ready. *"Go."*

Allow 2 minutes. *"Stop." "Pencils up."*

Turn the page over again just as if you were turning the page of a book.

4. Opposite Completion.

Now look at the directions at the top of this page while I read them. "One or more words have been left out of the following sentences. Complete each sentence by writing in the blank spaces a word which means just the opposite of the word which is underlined

and which will make a good sentence. Where there are two blank spaces, each word added must be the opposite of one of the underlined words. Write only *one* word in each blank."

Look at example A, "Joe had two dogs, a big dog and a (blank) dog." The word "big" is underlined. What can we write in the blank that is the opposite of big? (Little, small.) All right, write in the word which you choose. (Pause.)

Now look at the second example, B. The first underlined word is "rises." What is the opposite of "rises"? (Sets.) What is the opposite of the second underlined word, east? (West.) All right, write in the words to complete that sentence. (Pause.) *"Pencils up."*

Fill in the blank spaces in the sentences below just as we have done in the examples. Write only one word in each blank. Ready, *"Go."*

Allow 7 minutes. *"Stop."* Collect papers.

DIRECTIONS FOR GIVING
GENERAL EXAMINATION D

First write your name, then your age, your grade, the name of this school, and the date. (The other lines need not be filled in if the information has been given on General Examination C.)

Now open the paper, turning this page over to the left, and let us look at these pictures on the first inside page. (Examiner will hold up the page before the class.)

5. Faulty Pictures

"Pencils (or Pens) up." There is something wrong or missing in each picture on this page which makes it absurd. Find what it is and put a cross right where the part is wrong or missing. What is missing in the first picture? "Man's nose." Put a cross where the nose should be. *"Pencils (or Pens) up."* Mark the other pictures in the same way. Ready, *"Go."*

Allow 5 minutes. *"Stop."*

6. Disarranged Proverbs

"Pencils (or Pens) up." Let us read the directions. A. The words on each line below will make sense if arranged in the right order, and if one word is added. Find the word which should come first in each sentence, and mark a number 1 under it. The missing words are the last words in each sentence. Write them in on the dotted lines. Let us read the first example, Example A, "sweeps new a broom . . ." You see the words are all mixed up. Let us arrange them so as to make sense. What word should come first in the sentence? "A." (If the correct answer is not given by class after a moment's pause, it should be supplied by the examiner.) Put a number 1 under it. What is the second word? "New." What is the third word, "broom," and the fourth? "Sweeps." Now what word must be added? "Well" or "clean." Write the word in on the dotted line. Now, how does the whole sentence read? "A new broom sweeps clean (or well)."

Now let us try Example B.

"sun make while the hay . . ." Let us read the words as they stand. (Class reads.) Which word should come first in the sentence? "Make." (If the correct answer is not given by some member of class after a moment's pause, the answer should be given in each case by the examiner.) Yes! We will write 1 under "make" to show that it comes first. Which word should be second, third, fourth and fifth? (Examiner will repeat the words in the right order.) What word is missing? "Shines." We will write that in at the end. Now, how does the sentence read?

"Pencils (or Pens) up." Write a number 1 under the words which should come first in each line below and add the missing words. The words added should always be the last words in the sentences, just as they were in the examples. When you have done this, read the directions under B and C and do what it asks you to do. (Examiner should repeat direction to proceed to B and C if he sees any members of class finishing before time is called.) *"Pencils (or Pens) up."* Ready, *"Go."*

Allow ten minutes. *"Stop."*

7. Number Problems

A. *"Pencils (or Pens) up."* Do you see all these little piles of blocks? We want to find how many blocks there are in each pile. Let

us read the directions: "Count the number of blocks represented in each drawing and write the number in the little square in the lower right-hand corner of each section." (Examiner should point to squares.) How many blocks are there in the first drawing? "2." All right. Write 2 in the little square. *"Pencils (or Pens) up."* Now find how many blocks there must be in each of the other piles and write the answers in the little squares. Ready, *"Go."*

Allow 2 minutes. *"Stop"*

B. *"Pencils (or Pens) up."* Now let us read the directions under B.

"Write numbers in place of the dots so that the sums will be the same if added by column up and down, or across by rows. Look at the first group of numbers! Each column and each row of three figures should add up to nine. Let us add the first column of figures: $6 + 2 + 1$ is what? Now the second column: $2 + 2 + 5 = ?$, and the third column? $. + 5 + 3 = ?$. What number should be put in place of the dot so that the column will add up to nine? A number "1." Write it in place of the dot. Now what is the sum of the first row across the page?, of the second, and the third?

Now look at the next group of figures. What is the sum of the *first column:* $2 + 3 + 1$, and the sum of the *first row:* $2 + 0 + 4$? Now look at the second column and the *second row!* What number shall we write in place of the dot so that the second row and the second column will also add up to six? "2." Yes! All write a "2" in place of the dot.

"Pencils (or Pens) up." Now add the figures in the next group and find what number you will need to write in place of the dot so that the sum of each column and of each row will be the same. Then do all the other problems. Ready, *"Go."*

Allow 6 minutes. *"Stop."*

C. *"Pencils (or Pens) up."* Let us read the directions under C. "In place of dots supply numbers to give the answers as printed." Write only one number in the place of each dot, but first be sure that you know how to do the example, so as to get the answer which is printed there. *"Pencils (or Pens) up."* Ready, *"Go."*

Allow 6 minutes. *"Stop"*

DIRECTIONS FOR SCORING GENERAL EXAMINATIONS C AND D.

The scoring is facilitated by the use of the Scoring Cards. One card has been prepared for each examination. It is to be cut into sections according to accompanying directions. By assigning different parts of the test to different examiners, it is possible for several persons to coöperate in the scoring. Most of the tests can also be accurately scored by the pupils themselves, especially in the upper grades, if the work is done under careful supervision. The necessary information—lists of numbers, words, drawing of form completion, etc.—may be put on the blackboard. Questionable papers and tests in which the directions for scoring may be misunderstood or mis applied should then be checked by teacher or examiner.

Parts of the tests used as examples are, of course, not counted in the scoring.

Scores are assigned to each test on the following bases:

	Total points	
1. 1 point for each row of pictures correctly numbered.	15	
2. 1 point for each row of words correctly numbered....	15	
3. 1 point for each "block" correctly drawn and numbered	15	
4. 1 point for each correct word.....	34	
Total of points on Examination C.....		79
5. 1 point for each correct marking of some fault or flaw in a picture	24	
6. (A) 2 points if the word added is the last word of the sentence and it makes sense. The numbering of the words is neglected in the scoring .....(20)		
(B) 2 points for each correct number.....(8)		
(C) 4 points for a statement *in general terms* of the precise meaning of the proverb.		
2 points for a statement indicating a grasp of the general meaning of the proverb, but not clearly expressed, or for a specific statement or concrete example of the proverb.....(12)	40	
7. (A) 1 point for each correct answer.....(8)		
(B) 1 point for each example correctly completed. (8)		
(C) 1 point for each example correctly completed .....(12)	28	
Total of points on Examination D.....		92
Total for Series II (Exam. C + Exam. D)=		171

STANDARD SCORES AND DIRECTIONS FOR DETERMINING MENTAL AGES AND INTELLIGENCE QUOTIENTS.

A table giving the standard mental age equivalents of the various scores is printed on a following page and also on the back of the Record Sheet. The standards are given for both the Series as a whole and for each examination separately. To determine the approximate mental age of a pupil, find which of the standard scores is nearest his score, and look for the mental age at the head of the column. Look to the side to find the number of months, which should be added to the years previously found.

For example: in the table of Standards for Series II, on page 18, it will be found that a score of 85 is equivalent to a mental age of 13 years and 6 months.

After the mental ages have been entered in the M.A. column of the Record Sheet, the Intelligence Quotients may be calculated, if desired, by dividing the mental age of a child by his chronological age. The intelligence quotient expresses the relation between the chronological age and the mental age; or, to state it in another way, it is the ratio between the pupil's score and the average score made by pupils of his own age. For example: Mary Smith, who is 11 years, 10 months old, makes a score of 57, which is equivalent to the mental age of 11 years, 2 months. This mental age, when divided by 11 years, 10 months, her chronological age, gives an intelligence quotient of 94. The decimal point is ordinarily dropped.

THE INTELLIGENCE QUOTIENTS OF ADULTS

It will be noted in referring to the standard scores that the scores given as mental age equivalents after the age of 14 and a half are printed in italics. This is to call attention to the fact that these scores have a different meaning from those which precede them. The standard scores for both the individual intelligence tests of Binet and of the various group tests of intelligence have been based on the accomplishment of children in school. Practically all children are in school in the communities studied between the ages of 7 or 8 and 14. This makes it possible to secure averages for these ages which are reliable. The pupils who remain in school after the age of 14 are a selected group. Investigations of the author indicate that those who drop out of school are, *on the average*, somewhat inferior in intelligence to those who remain in school.

In various communities in which it has been possible to test practically all of the children of fifteen years of age, both those who have left the regular schools and those who have remained in school, he has found that the average score of the fifteen year olds is the same as the fourteen year olds. This would seem to indicate that maturity in mental growth is reached *on the average* at fourteen years, in other words, that this is the average adult mental age. The reason why the age score standards in the various individual and group tests increase beyond this age is that they have been based on the tests of the children who remain in school. The increase would seem, therefore, to be only apparent and due to the factor of selection (and probably also due to some extent to training). It has been customary to assume 16 (in the case of some writers 18) as the average adult mental age, and in determining the intelligence quotient of an individual whose chronological age is in excess of 16 years, *e.g.*, 20 years, to divide his "mental age" by 16 and not 20. In view of the above findings, it is recommended that the denominator should be 14½. For convenience scores are given as of "mental ages" 15 years, etc., up to 20 years and 8 months. These scores above 14 years and 6 months *are not the averages of individuals of these ages, and are, therefore, not strictly mental ages as the term is ordinarily used.* But the score, for example, under 16 years is a score which is as much superior to the score of the average adult of mental age 14½, as the score designated by mental age 13 years is inferior to this average adult score, and since the difference in the scores of 13 year olds and 14½ year olds is ordinarily expressed in terms of mental age, the same difference in scores above 14½ may, also, for convenience be expressed as a "mental age," a difference in the case of the above example of 1½ years. For further justification of the method the examiner must be referred to an article of the author on "The Intelligence Quotients of Adults."* It should be noted, however, that further investigations will be needed before the exact mental age of the average adult can be finally established. The author's findings simply indicate that with these tests, the average adult mental age is nearer to 14½ years than to 16, and that more accurate comparisons can be made by calculating the intelligence quotients on this basis.

For practical purposes the following directions are sufficient. In calculating intelligence quotients of pupils whose chronological ages are fourteen and one-half or under, follow the usual method of dividing the "mental age" which his score in the test gives him by his exact chrono-

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**The Journal of Educational Research.* November, 1922, pp. 307-325.

logical age. In the case of pupils over fourteen and one-half years in chronological age, divide the mental age equivalent to his score in the test by fourteen and one-half.

The following examples are given for illustration:

(1) J. J., age 12 years, 6 months, score in tests 112, which is equivalent to a "mental age" of 15 years, 9 months. Dividing the "mental age" of 15 years, 9 months, by 12 years, 6 months, gives an intelligence quotient of 126.

(2) A. W., age 16 years, 4 months, score in tests 106, which is equivalent to a "mental age" of 15 years, 3 months. Dividing the "mental age" of 15 years, 3 months, in this case not by his full chronological age, but by 14 years, 6 months, gives an intelligence quotient of 105.

THE INTERPRETATION OF INTELLIGENCE QUOTIENTS.

Intelligence quotients between 90 and 110 are considered "average." Those of 70 or below, when accompanied by marked retardation in school and deficiency in school work, ordinarily indicate the desirability of training in special classes. Intelligence quotients of 130 or over, when the school work is satisfactory, usually indicate the desirability of placement in rapid advancement classes, extra promotion, or extra work in the present school grade. In doubtful and "borderline" cases, and especially when the intelligence quotients are below 80 or over 120, these tests should, when possible, be supplemented by individual mental tests and standard tests of school accomplishment.

It must always be remembered that the results of a single examination cannot ordinarily be taken as final, or at least only within certain limits. A variation of five or six points in the intelligence quotients is frequently found on a repeated examination. The variation is often less than this but occasionally it is much greater. A safe deduction is that the pupil may be credited with at least as high a mental age as he secures in the series of tests. Except for the rare instances of copying or special coaching, a pupil does not get a higher score than his abilities warrant. Various factors, on the other hand, may be responsible for his failing to do himself justice on a given examination. In cases where the pupil's standing is much lower than would seem warranted in view of his school accomplishments, it is well to treat the examinations separately and see whether his mental age is higher on one examination, *e.g.*, General Examination C, than on the other. Although the combined score of the two examinations is usually more reliable than that of either alone, where

there is a marked difference between them, there is sufficient justification for calculating the mental age on the basis of that examination in which the individual secures the higher score. It is also well to note whether the pupil's failure is general or limited to one or two tests. In doubtful cases it is recommended that the tests be given again to the pupils individually or that the results be checked by one of the standard revisions of the Binet tests.

Differences between the judgments of teachers and the results of the tests are to be expected in many cases. Teachers naturally estimate intelligence from the success or failure in school studies and sometimes from the success or failure in a single school subject. They frequently underestimate the intelligence of pupils who are younger than the average of the class and overestimate that of over-aged pupils. One of the purposes of the tests is to aid in the correction of these judgments.

Pupils may be given the *scores* which they receive on the test. On the whole, it seems best not to report the mental ages or intelligence quotients to them or to their parents.

GRADE COMPARISONS

To determine quickly the "average" performance of a class, sort the papers and arrange them according to scores, with the lowest on top. Find the middle paper after they have been put in proper order, and the score of this paper is the Median. If there are an even number of papers the median is half-way between the scores of the two middle papers. Standard medians for the grades are not given, as the performance to be expected depends upon the ages of the pupils tested and upon what are considered the "normal" ages for the various grades. These ages are conditioned upon the time of year when the tests are given, the age at which pupils are admitted to school, and upon the amount of retardation in the lower grades, and the character of the elimination from the upper grades. To secure, however, the approximate standard for any grade at the time the tests are given, first find the median of the chronological ages of the class or classes, then find in the table the score corresponding to this age. This will give the median mental age which should ordinarily be expected.

The median *grade* scores of the communities from which the age standards were obtained are given on page 18 for comparison, but are, for the reasons stated, not proposed as standards. The median chronological ages of these grades at the time the tests were given is also stated.

In making comparisons of the average intelligence of various grades, the above-mentioned factors must be taken account of. The average intelligence of above age and under age grades will, of course, differ greatly.

One very practical use may, however, be made of the grade findings. The relative accomplishment of the various grades in their school studies, as determined by the standard educational tests or otherwise, should show a definite relationship to the relative intelligence of the pupils in these grades.

RELIABILITY AND VALIDITY OF SERIES II

In selecting an intelligence test the two most important items to be considered are its reliability and validity. Reliability may be determined by calculating the correlation coefficients between scores obtained on the test by the same pupils at different times, or by correlating the odd and even items of the test.

Reliability coefficients of General Examination C for several grades and ages are given in the table below. They were calculated by means of the Spearman-Brown technique using the odd and even items as the two variables. These coefficients are high for a single age and grade, indicating a reliable test.

Reliability Coefficients for General Examination C

Age	No.	Reliability Cofficients
11	53	.93
12	115	.92
13	134	.87
14	132	.91
15	73	.87
Grade		
VI	129	.92
VII	209	.90
VIII	117	.84
IX	110	.88

Validity of a test is a measure of the extent to which it correlates with some other criteria of intelligence. Since the Stanford-Binet is generally considered one of the best measures of intelligence, it has frequently been used as a criterion of intelligence in studying the validity of group intelligence tests. The correlation between the Stanford-Binet and Series II I. Q.'s of 196 children in grades 6 to 9 was found to be .87 + .01, and between the Stanford-Binet and General Examination C in 1924 children aged 8 to 13 .82 + .005.

While these validity coefficients are sufficiently high to indicate a good test, they probably do not do it justice. One of the aims in its construction was the development of an instrument which would enable the child with inadequate language facilities to more nearly demonstrate his true ability than is possible on a test as linguistic as the Stanford-Binet. In so far as this has been successful it has increased the validity of the test, even though it has, at the same time, lowered the correlation between it and the Stanford-Binet.

When a group of 252 pupils were divided into 10-point Stanford-Binet I. Q. groups it was found that the algebraic average of the differences between the Binet I. Q. and that of General Examination C were small. The greatest difference was 2.4 points, the next greatest 1.3. Each of the other five groups had an average difference of less than one point. The greatest average difference (signs considered) between the Binet I. Q. and that of a modified form of General Examination D was 6.6 I. Q. points. That of the other six tests studied varied between 10.2 and 15.8.

STANDARDS FOR REVISED SERIES II

Years	6	7	8	9	10	11	12	13	14	*15*	*16*	*17*	*18*	*19*	*20*	
Months																Months
0		8	20	31	43	55	67	79	91	*103*	*115*	*127*	*139*	*151*	*163*	0
1		9	20	32	44	56	68	80	92	*104*	*116*	*128*	*140*	*152*	*164*	1
2		10	21	33	45	57	69	81	93	*105*	*117*	*129*	*141*	*153*	*165*	2
3		11	22	34	46	58	70	82	94	*106*	*118*	*130*	*142*	*154*	*166*	3
4		12	23	35	47	59	71	83	95	*107*	*119*	*131*	*143*	*155*	*167*	4
5		13	24	36	48	60	72	84	96	*108*	*120*	*132*	*144*	*156*	*168*	5
6	2	14	25	37	49	61	73	85	97	*109*	*121*	*133*	*145*	*157*	*169*	6
7	3	15	26	38	50	62	74	86	*98*	*110*	*122*	*134*	*146*	*158*	*170*	7
8	4	16	27	39	51	63	75	87	*99*	*111*	*123*	*135*	*147*	*159*	*171*	8
9	5	17	28	40	52	64	76	88	*100*	*112*	*124*	*136*	*148*	*160*		9
10	6	18	29	41	53	65	77	89	*101*	*113*	*125*	*137*	*149*	*161*		10
11	7	19	30	42	54	66	78	90	*102*	*114*	*126*	*138*	*150*	*162*		11

STANDARDS FOR EXAMINATION C

Years	7	8	9	10	11	12	13	14	*15*	*16*	*17*	*18*	*19*	*20*	
Months															Months
0	0	6	12	18	24	30	36	42	*48*	*54*	*60*	*66*	*72*	*78*	0
2	1	7	13	19	25	31	37	43	*49*	*55*	*61*	*67*	*73*	*79*	2
4	2	8	14	20	26	32	38	44	*50*	*56*	*62*	*68*	*74*		4
6	3	9	15	21	27	33	39	*45*	*51*	*57*	*63*	*69*	*75*		6
8	4	10	16	22	27	34	40	*46*	*52*	*58*	*64*	*70*	*76*		8
10	5	11	17	23	28	35	41	*47*	*53*	*59*	*65*	*71*	*77*		10

STANDARDS FOR EXAMINATION D

Years	7	8	9	10	11	12	13	14	*15*	*16*	*17*	*18*	*19*	*20*	*21*	
Months																Months
0	7	13	19	25	31	37	43	49	*55*	*61*	*67*	*73*	*79*	*85*	*91*	0
2	8	14	20	26	32	38	44	50	*56*	*62*	*68*	*74*	*80*	*86*	*92*	2
4	9	15	21	27	33	39	45	51	*57*	*63*	*69*	*75*	*81*	*87*		4
6	10	16	22	28	34	40	46	*52*	*58*	*64*	*70*	*76*	*82*	*88*		6
8	11	17	23	29	35	41	47	*53*	*59*	*65*	*71*	*77*	*83*	*89*		8
10	12	18	24	30	36	42	48	*54*	*60*	*66*	*72*	*78*	*84*	*90*		10

MEDIAN GRADE SCORES*

Revised Series II

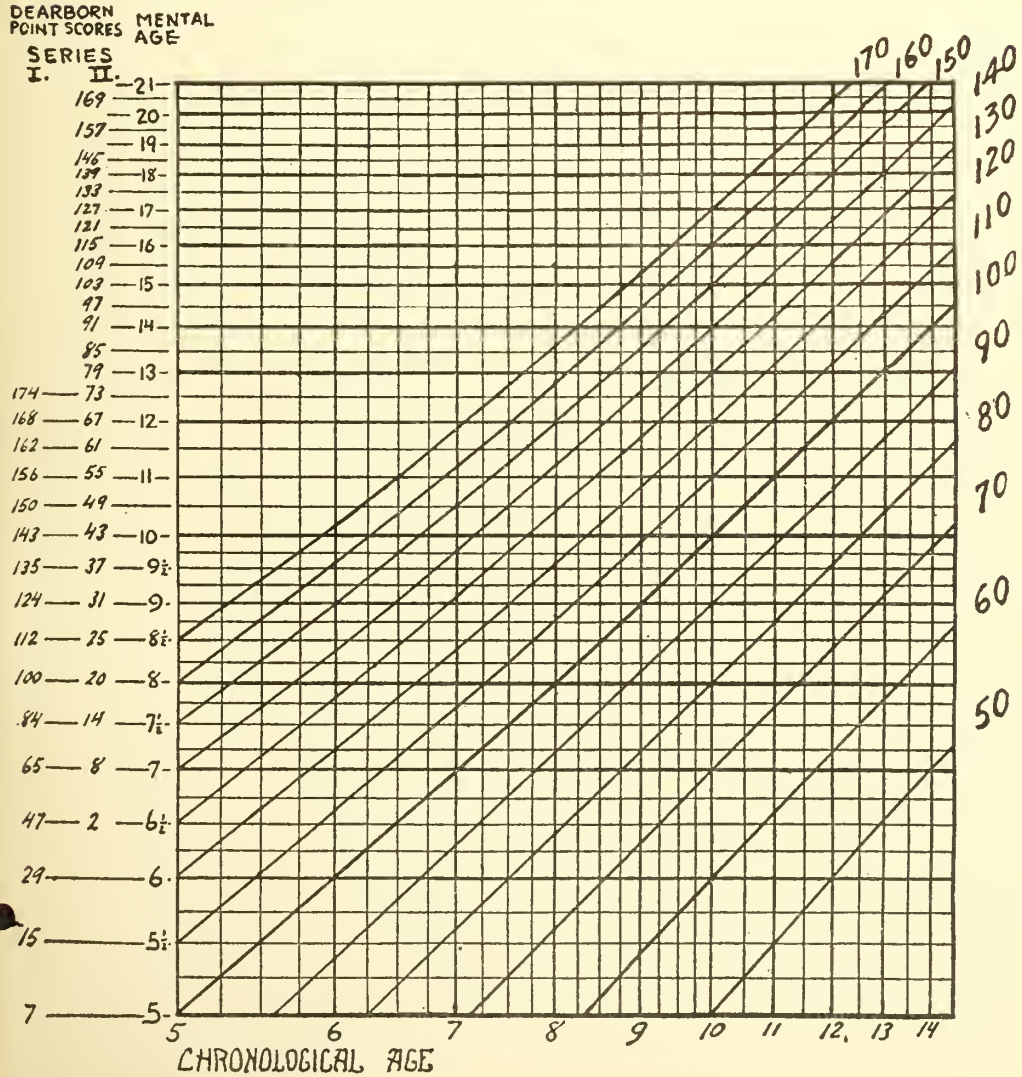
Grade	Median Age	Median Score	P. E.
II	7–9	13.7	± 5.5
III	8–10	25.8	± 8.2
IV	9–8	35.9	± 8.15
V	10–9	50.5	±11.5
VI	11–6	62.35	±11.5
VII	12–8	75.6	±14.15
VIII	13–4	89.7	±14.7
Freshmen	14–5	105.8	±13.7
Sophomores	15–2	115.6	±11.95
Juniors	16–4	125.9	±13.75
Seniors	17–4	129.6	±12.3

*See page 15 for discussion of this table.

CHART FOR CALCULATING INTELLIGENCE QUOTIENTS

Approximate intelligence quotients may be found from the following chart, either directly from the score or from the derived mental age. To use the chart first locate the score (or M. A.) in the column at the left and the age on the scale at the bottom. The horizontal line representing the score and the vertical line representing the chronological age are then followed inward to the point of their intersection, and the diagonal line which lies nearest this point is followed upward to the scale of I.Q.'s on the right hand margin.

Thus if a child of 10–0 makes of score of 55 in Series II, 10 is located at the foot of the chart, followed up until it meets the horizontal line of 55. By following the nearest diagonal to this the I. Q. is seen to be 110. When the intersection falls some distance from the diagonal a more correct I. Q. can be obtained by estimating the distance between the lines, *e.g.*, if half way between the 80 and 90 diagonal an I. Q. of 85 may be assigned.



Dearborn Group Tests

Revised Edition

SERIES II

Examination C

NAME ..... BOY or GIRL.....
Last First Middle

DATE 19..... GRADE.....
Year Month Day

DATE of BIRTH 19.....
Year Month Day

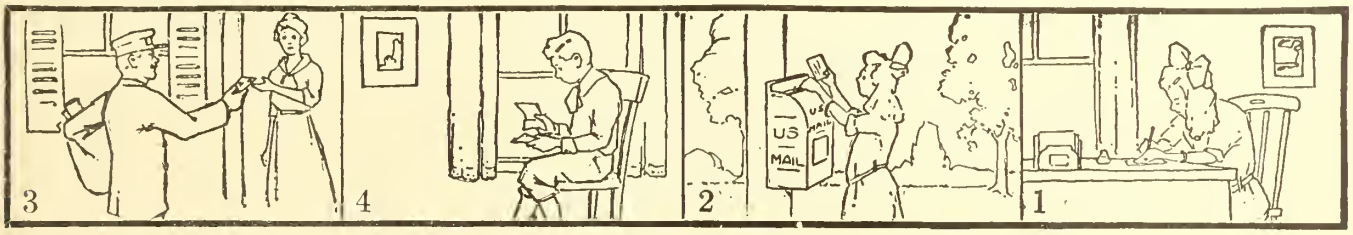
AGE .....
Years Months Days

TEACHER .....

CITY .....

SCHOOL .....

Example A



A

Example B

B

SCORE

(1) _____

(2) _____

(3) _____

(4) _____

Total _____

_____

_____

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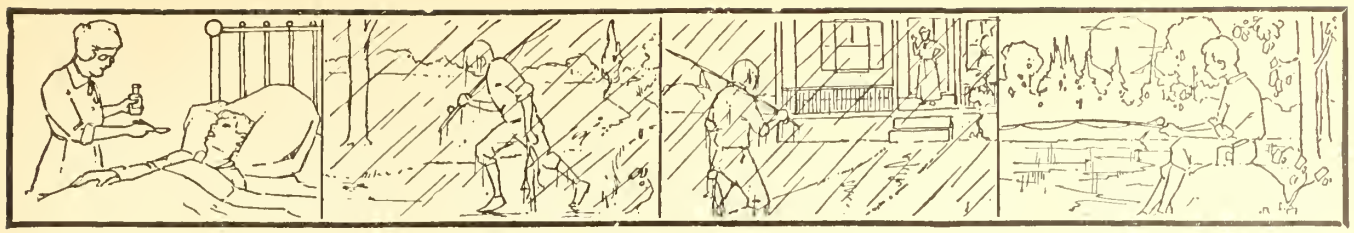
1



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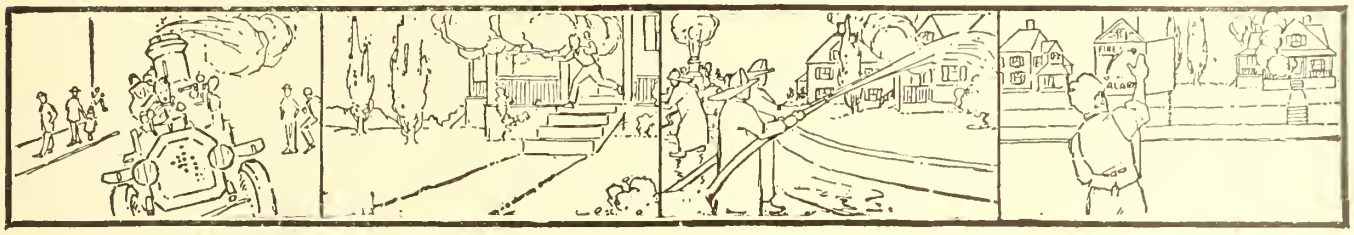

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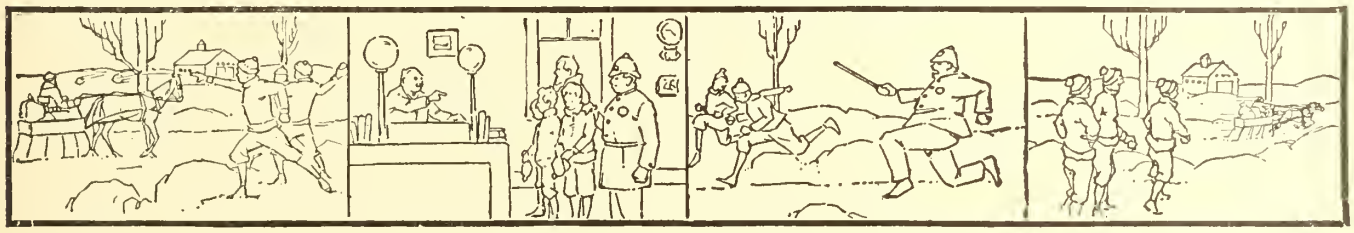

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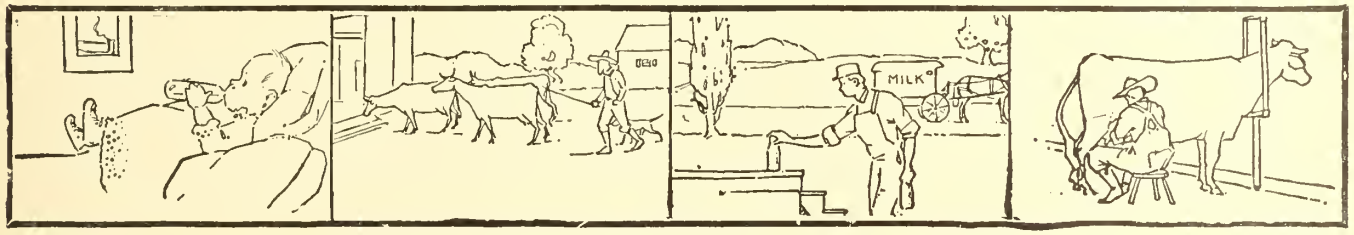

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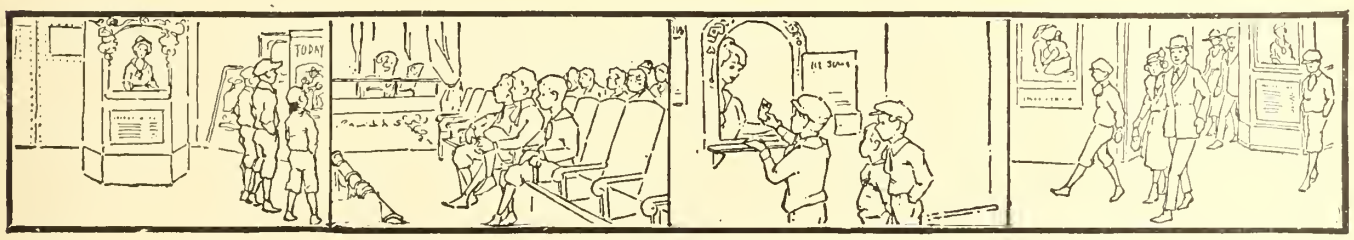

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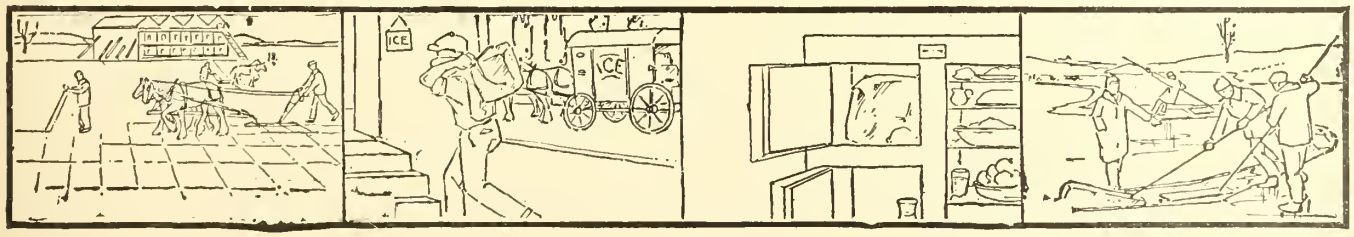

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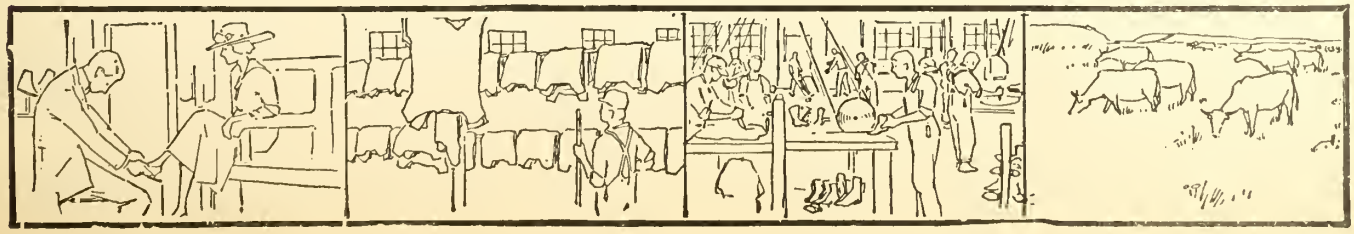

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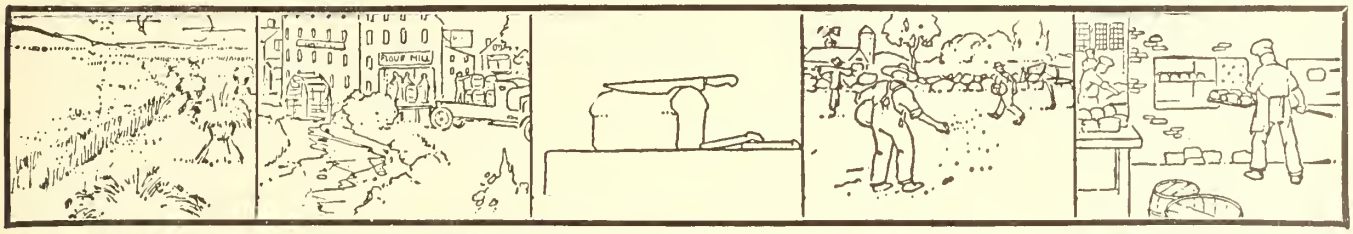

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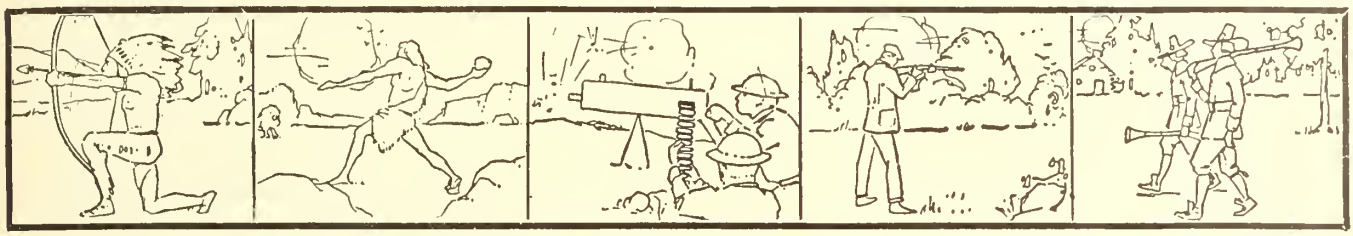
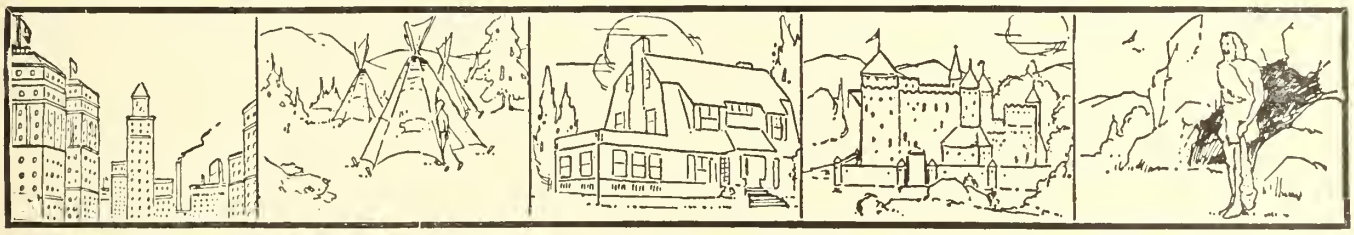


11

12

13



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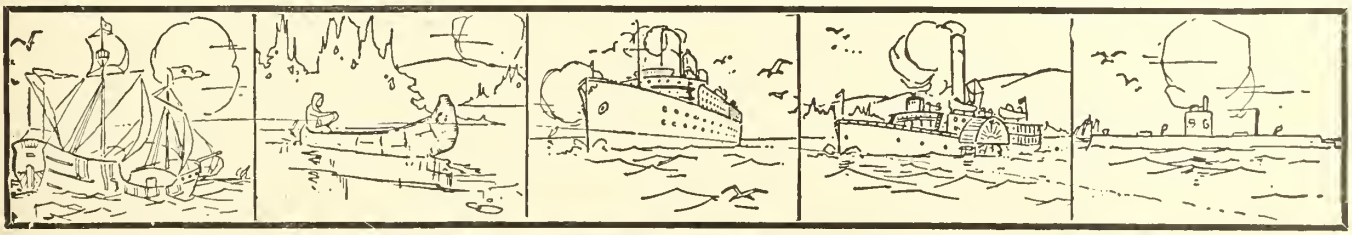

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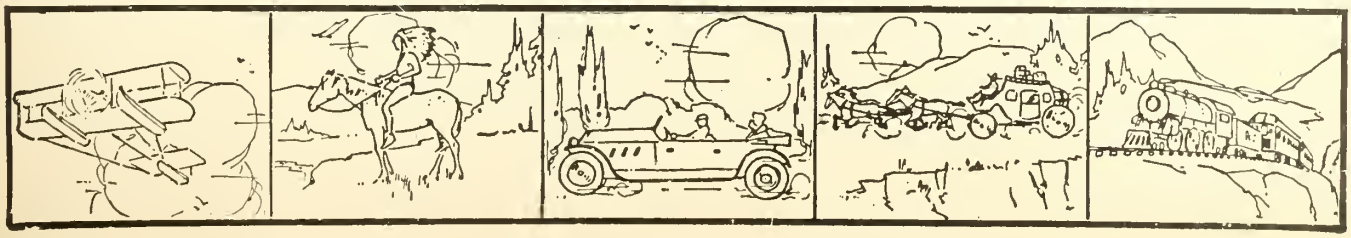
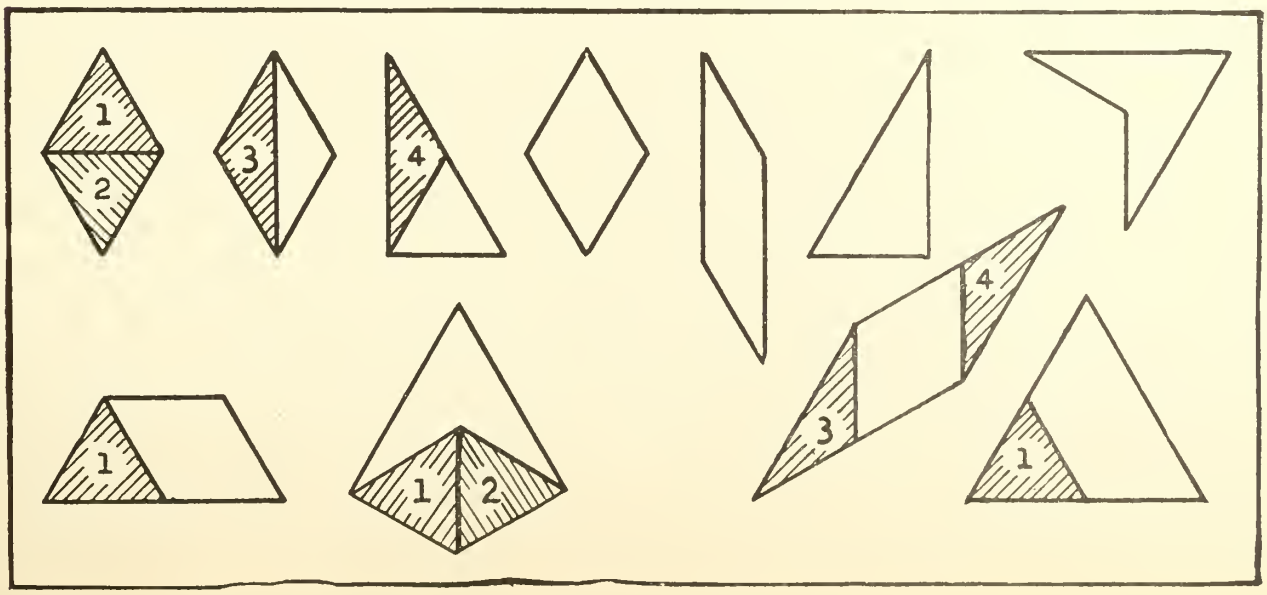


(2) Directions:—Number the following words to show their proper order. Put the numbers directly under the words as in the following example A.

Example A.	dinner	supper	breakfast		A
	2	3	1		
Example B.	fruit	flower	seed	plant	B

1	syrup	cane	candy	sugar						1
2	noon	sunrise	night	afternoon	sunset					2
3	house	logs	lumber	forest						3
4	Jan.	Aug.	Feb.	June	April	Mar.	Sept.	May	July	4
5	harvesting	planting	ploughing	cultivating						5
6	flour	wheat	bread	dough	toast					6
7	dress	silkworm	cocoon	satin						7
8	linen,	writing paper,	flax,	linen rags,	pulp,	letter				8
9	weaving,	wool,	carding,	yarn,	cloth,	spinning,	garment			9
10	standing	running	sitting	crawling	lying					10
11	sinking ship,	fog,	rescue,	life saving boats,	collision					11
12	physician,	football game,	recovery,	bandage,	broken leg,	tackle				12
13	mining	coining	prospecting	money	refining					13
14	convention	election	voting	nomination	inauguration	campaign				14
15	armistice,	battles,	declaration of war,	peace conference,	recruiting,	victory				15

(3)



(4) DIRECTIONS. One or more words have been left out of the following sentences. Complete each sentence by writing in the blank space a word which means just the opposite of the word which is underlined and which will make a good sentence. Where there are two blank spaces the opposite of each underlined word must be added. Write only one word in each blank.

EXAMPLES. A. Joe had two dogs, a big dog and a.....dog.

B. The sun rises in the east and.....in the.....

---

1 We had a hot summer and a.....winter. 1

2 The right arm is usually stronger than the.....arm 2

3 He hunted high and.....for his hat. 3

4 A lady.....her purse, and a little girl found it. 4

5 The man wore a new hat and an.....coat. 5

6 A.....lady helped an old man across the street. 6

7 The beginning of the story was better than the..... 7

8 John was sick last week but now he is..... 8

9 .....people are usually heavier than short people. 9

10 In the.....he intends to do better than in the past. 10

11 Generals command; soldiers..... 11

12 The lake is deep, but the river is..... 12

13 He had rather..... .....than borrow. 13

14 Some thought him.....; others, guilty. 14

15 Few would note his presence, but.....his..... 15

16 Poor, but honest;....., but..... 16

17 John is economical and careful; Joe,.....and..... 17

18 Heat expands;..... 18

19 He was rich and proud; his servant.....and..... 19

20 They often succeeded, and..... 20

21 The latter were inferior; the.....were..... 21

22 The younger men were radical; the.....were..... 22

23 When tired he was taciturn; when....., ... 23

24 The ignorant believed; the 24

Dearborn Group Tests

Revised Edition

SERIES II

Examination D

NAME ..... BOY or GIRL .....
Last First Middle

CITY ..... GRADE .....

DATE 19 ..... TEACHER .....
Year Month Day

DATE of BIRTH 19 ..... SCHOOL .....
Year Month Day

AGE ..... SCORED BY .....
Years Months Days

Score.....

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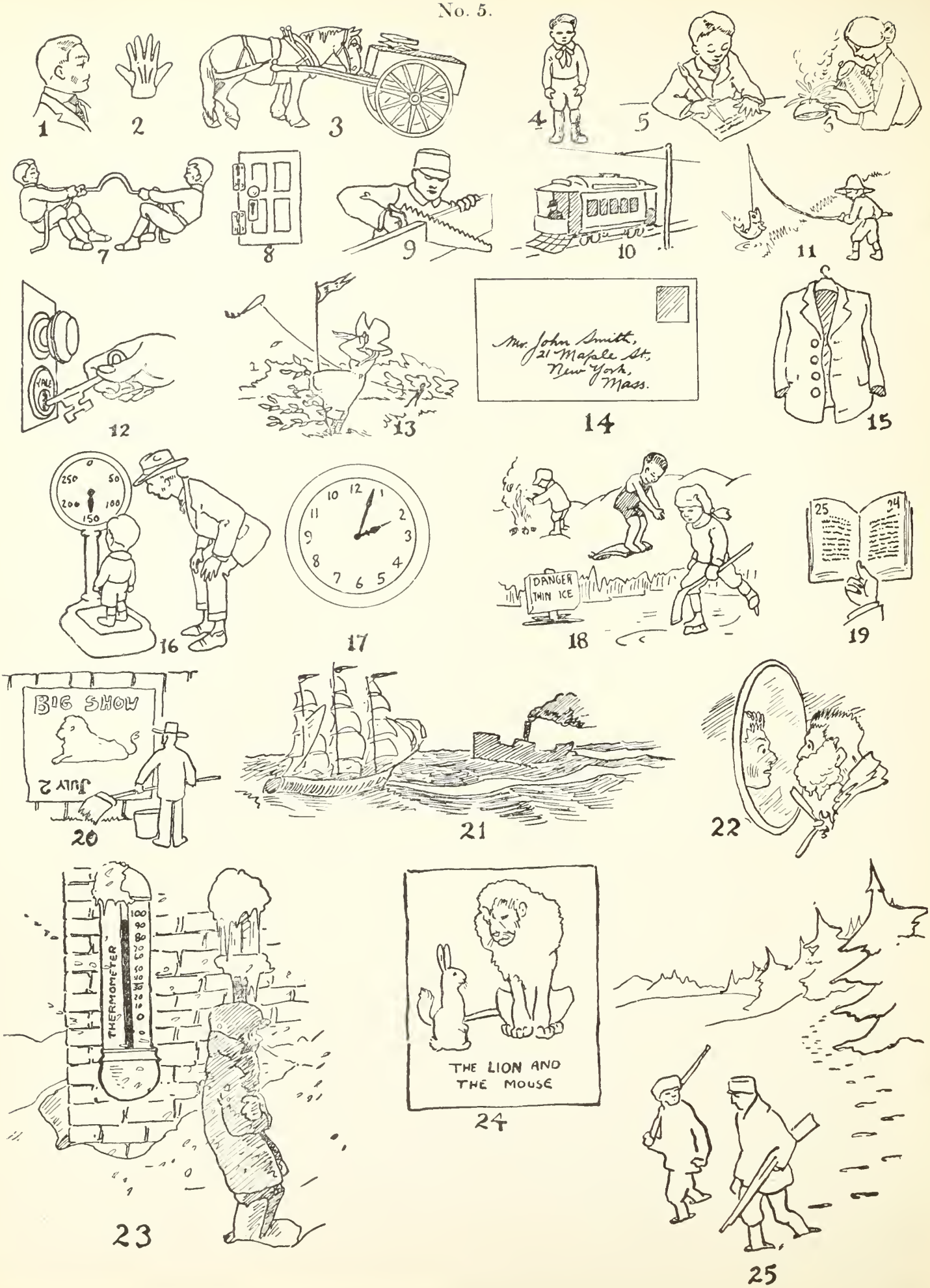
No. 5.


1
2
3
4
5
6
7
8
9
10
11
12
13
Mr. John Smith,
21 Maple St.,
New York,
Mass.
14
15
16
17
DANGER
THIN ICE
18
19
BIG SHOW
JULY 2
20
21
22
THERMOMETER
23
THE LION AND
THE MOUSE
24
25

No. 6. Directions. A. The words on each line below will make sense if arranged in the right order, and if one word is added. Find the word which should come first in each sentence, and mark a number 1 under it. The missing words are the last words in the sentences. Write them in on the dotted lines.

Example A. sweeps new a broom.....

Example B. sun make while the hay.....

---

1 in time a saves stitch..... 1

2 spoil many cooks too the 2

3 its rose has every 3

4 the early catches the bird... 4

5 known is by its tree a 5

6 the rod spoil and spare the 6

7 no gathers a stone rolling..... 7

8 feather a birds flock of..... 8

9 which no it is long a road has 9

10 does make a swallow not one 10

B. Which of the above proverbs (Nos. 1 to 10) are explained by the following statements?

11 People seek companions like themselves. Explains No.. (11)

12 We are judged by what we accomplish. Explains No... (12)

13 Much circumstantial evidence is necessary for proof. Explains No... (13)

14 Opportunities seized make for success. Explains No... (14)

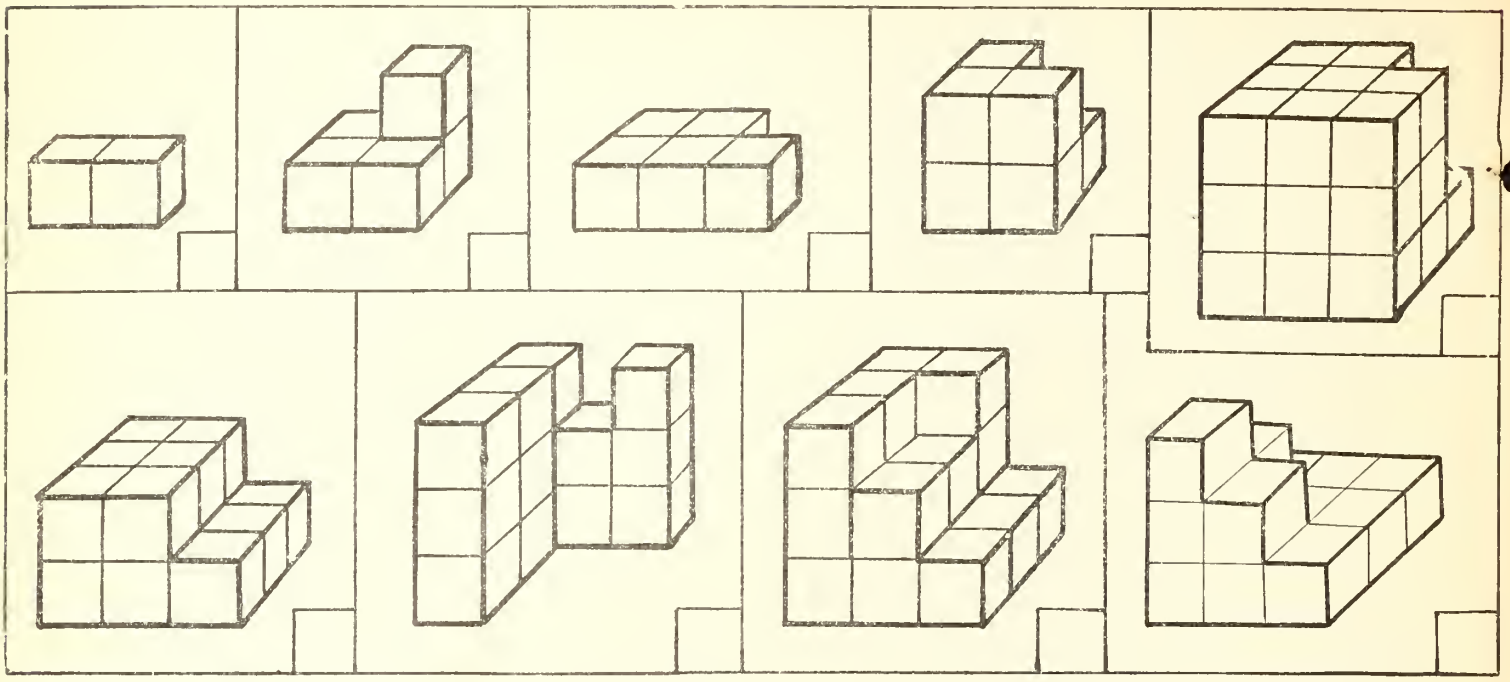
C. On the following lines tell in your own words the meaning of each of the first three proverbs. (Nos. 1, 2 and 3.)

No. 1. .....(15)

No. 2.....(16)

No. 3.....(17)

No. 7 A. Directions. Count the number of blocks represented in each drawing and write the number in the little square in the lower right hand corner of each section.



B. Directions. Write numbers in place of the dots so that the sums will be the same if added by columns up and down, or across by rows.

6 2 .	2 0 4	7 4 .	3 1 5	8 . 2
2 2 5	3 . 1	6 8 6	4 3 .	4 7 .
1 5 3	1 4 1	7 8 5	2 . 2	3 3 9
5 . .	9 4 .	. 7 7	. 7 .	6 9 .
5 5 .	7 . .	9 6 4	8 9 8	. 8
4 3 7	1 8 .	. 6 .	. . .	. 7

C. Directions. In place of dots supply numbers to give the answers as printed.

3 6	7 5	. 6	2 .	1 .	9 .	. 7
1 .	2 .	3	3 9	6	2 7	2
4 9	5 4	4 8	6 2	9 0	6 6	5 4
9 4 .	4 1 7	. . 9 5	9 . 3 1	1 . 0
. 5 3	. . 1	1 7 . .	. 7 . .	1 2
7 9 5	7 0 8	9 1 2 0	1 4 9 2	1 4 4 0

TERMAN–McNEMAR TEST OF MENTAL ABILITY

By Lewis M. Terman
Stanford University, California

and Quinn McNemar
Stanford University, California

C

TEST: FORM C

Name .....

Date of birth ..... Month ..... Day ..... Year

Age ..... Grade ..... Boy ..... Girl .....

School .....

City ..... State .....

Teacher ..... Date .....

Test	Score
1	
2	
3	
4	
5	
6	
7	
Total	
MA	
IQ	

Study the examples below in order to see how the answer spaces should be marked to indicate the correct answers.

1. Steel is made from
1 lead **2 iron** **3 tin** **4 copper** **5 zinc** 1

1 2 3 4 5

The correct answer, **iron**, *is number 2, so the second answer space has been blackened. You mark the correct answers for the remaining samples in the same way.*

2. A horse always has
6 rider **7 stable** **8 shoes** **9 hoofs** **10 saddle** 2

6 7 8 9 10

3. A quart is one fourth of a
1 gallon **2 pint** **3 bushel** **4 barrel** **5 keg** 3

1 2 3 4 5

In taking this test, you are first to decide which answer is correct, and then blacken with a soft *pencil* the answer space which is numbered the same as your choice for the correct answer. Make your mark as long as the pair of lines, and move the pencil up and down firmly to make a **heavy black** line. If you change your mind, erase your first mark completely.

Published by World Book Company, Yonkers-on-Hudson, New York, and Chicago, Illinois

PRINTED IN U.S.A. *Edition a*

TEST 7. BEST ANSWER

Read each statement and mark the answer space which has the same number as the answer which you think is BEST.

SAMPLE. We should not put a burning match in the wastebasket because
1 Matches cost money. 2 We might need a match later.
3 It might go out. 4 It might start a fire. . . . . .

1 2 3 4

1. The saying, "Idle brains are the devil's workhouse," means
1 The devil is lazy. 2 People who are idle get into trouble.
3 Many hands make light work. 4 The devil works with his brains. 1

2. The saying, "It's an ill wind that blows nobody good," means that
5 Winds bring rain. 6 That which brings misfortune to some may help others.
7 Trade winds help commerce. 8 It's easy to catch cold in a storm. 2

3. Farmers rotate crops because
1 Variety is the spice of life. 2 It confuses the plant pests.
3 It helps maintain soil fertility. 4 It gives the farmer a balanced diet. 3

4. The saying, "Little strokes fell great oaks," means
5 Continued effort brings results. 6 Oak trees are weak.
7 Little strokes are best. 8 Anyone can fell an oak. 4

5. The saying, "A miss is as good as a mile," means
1 A girl can walk just about a mile. 2 Errors are unpardonable.
3 The evil men do lives after them. 4 A failure is a failure, no matter how small. . . .5

6. The saying, "It never rains but it pours," means
5 Salt stays dry when it rains. 6 Every cloud has a silver lining.
7 Troubles seldom come singly. 8 Storms are more frequent than showers. 6

7. The cause of echoes is
1 Static electricity in the air. 2 The reflection of sound waves.
3 The absence of anything in the air. 4 Not known. 7

8. The saying, "Look before you leap," means
5 Consider first, act afterward. 6 Trust your eyes, but not your feet.
7 Anything is right which looks right. 8 Never take chances. 8

9. The saying, "Never ride a free horse to death," means
1 Never accept free rides. 2 Never abuse privileges granted as favors.
3 One should prize anything that is free. 4 A horse is to ride, not to kill. 9

10. The saying, "If the shoe fits, wear it," means
5 Be sure to buy shoes that fit. 6 Give the devil his due.
7 Don't take unnecessary steps. 8 Recognize your own faults and virtues. 10

11. Copper is used for electric wiring because
1 It is decorative. 2 It is easily bent.
3 It retains heat. 4 It is a good conductor. 11

12. The saying, "Don't cross your bridges till you come to them," means
5 Where there's a will there's a way. 6 Everything comes to him who waits.
7 Don't anticipate possible troubles. 8 Bridges are dangerous. 12

Score . . . . . .

TEST 1. INFORMATION

Mark the answer space which has the same number as the word that makes the sentence TRUE.

SAMPLE. Our first President was
1 Adams 2 Washington 3 Lincoln 4 Jefferson 5 Monroe . . . .

1 2 3 4 5

1. Polo is a kind of
1 disease 2 work 3 bear 4 game 5 language 1
2. Herring is a kind of
6 wig 7 flower 8 pattern 9 jewel 10 fish 2
3. The lyre was an early instrument used in
1 music 2 writing 3 mining 4 farming 5 sculpturing 3
4. Linen is made from
6 hair 7 jute 8 flax 9 rayon 10 latex 4
5. Burlap is a kind of
1 lumber 2 stone 3 hood 4 fabric 5 comedy 5
6. Quicksilver is another name for
6 chromium 7 tin 8 mercury 9 aluminum 10 lead 6
7. The number of pounds in a ton is
1 (*1000*) 2 (*2000*) 3 (*3000*) 4 (*4000*) 5 (*5280*) 7
8. Chinchilla is a kind of
6 fur 7 seasoning 8 chemical 9 malady 10 furniture 8
9. The fathom is a measure of
1 weight 2 curvature 3 hardness 4 depth 5 strength 9
10. Larceny is a term used in
6 forestry 7 medicine 8 theology 9 pedagogy 10 law 10

1 ➔

11. Napoleon's final defeat was at
1 Waterloo 2 Paris 3 Verdun 4 Elba 5 Leipzig 11
12. The dynamo produces
6 dynamite 7 powder 8 electricity 9 gas 10 steam 12
13. Pasteur was a famous
1 traveler 2 boxer 3 artist 4 bacteriologist 5 physicist 13
14. The Pharaohs were kings of
6 Babylon 7 Jerusalem 8 Syria 9 Greece 10 Egypt 14
15. Sonata is a term used in
1 drawing 2 drama 3 music 4 poetry 5 phonetics 15
16. The Colosseum was an
6 amphitheater 7 aqueduct 8 aquarium 9 archway 10 army 16
17. The larynx is in the
1 abdomen 2 throat 3 head 4 ear 5 pelvis 17
18. Among birds that migrate widely are
6 eagles 7 cardinals 8 owls 9 robins 10 quail 18
19. Emeralds are usually
1 red 2 yellow 3 green 4 purple 5 blue 19
20. Sirloin is a cut of
6 mutton 7 beef 8 veal 9 lamb 10 pork 20
21. The head of a museum is called a
1 musician 2 curator 3 mortician 4 pastor 5 collector 21
22. A six-sided figure is called a ➔
6 pentagon 7 hexagon 8 sextet 9 helix 10 scholium 22
23. The bat is most closely related to the
1 butterfly 2 swallow 3 owl 4 mouse 5 moth 23
24. A character in "David Copperfield" is
6 Tiny Tim 7 Uriah Heep 8 Scrooge 9 Goliath 10 Darnell 24
25. Quinine comes from
1 leaves 2 roots 3 medicine 4 minerals 5 bark 25

Score . . . . . .

TEST 6. OPPOSITES

Mark the answer space which has the same number as the word which is OPPOSITE, or most nearly opposite, in meaning to the beginning word of each line.

SAMPLE. north — 1 hot 2 east 3 west 4 down 5 south . . . . . .

1. exit — 1 emit 2 transcend 3 entrance 4 origin 5 arrival 1
2. amateur — 6 novitiate 7 musical 8 professional 9 inventor 10 experience 2
3. genuine — 1 stolen 2 counterfeit 3 sincere 4 original 5 unworthy 3
4. abundance — 6 liberality 7 frugality 8 luxury 9 hunger 10 scarcity 4
5. alert — 1 illiterate 2 pert 3 sluggish 4 disabled 5 easy 5
6. waste — 6 refuse 7 conserve 8 devastate 9 dole 10 generate 6
7. humiliated — 1 honored 2 refreshed 3 satisfied 4 lively 5 arrogant 7
8. gravity — 6 fragility 7 specificity 8 purity 9 constancy 10 levity 8
9. limitation — 1 explanation 2 encouragement 3 ability 4 freedom 5 speed 9
10. monotony — 6 difficulty 7 diversion 8 harmony 9 repetition 10 variety . . . 10

6

11. obtuse — 1 accessible 2 abstruse 3 acute 4 corpulent 5 agile 11
12. expel — 6 remain 7 propel 8 exile 9 retain 10 contract 12
13. asset — 1 bankruptcy 2 descent 3 misery 4 mortgage 5 liability 13
14. acid — 6 alkaline 7 neutral 8 pepsin 9 briny 10 chemical 14
15. eccentric — 1 particular 2 stupid 3 egocentric 4 ordinary 5 virtuous 15
16. disperse — 6 approve 7 remove 8 gather 9 spare 10 whisper 16
17. wax — 1 pale 2 waive 3 shine 4 age 5 wane 17
18. blithe — 6 helpless 7 cheerless 8 stingy 9 lazy 10 slow 18
19. active — 1 past 2 careless 3 passive 4 pensive 5 dull 19
20. depress — 6 press 7 elate 8 oppress 9 exhort 10 climb 20
21. concede — 1 deny 2 recede 3 finesse 4 usurp 5 resign 21
22. recline — 6 succumb 7 stretch 8 erect 9 stand 10 decline 22
23. invincible — 1 susceptible 2 weak 3 stubborn 4 visible 5 broken 23
24. rash — 6 prudent 7 worthy 8 smooth 9 irrational 10 stringent 24
25. defile — 1 confess 2 file 3 excel 4 purify 5 beautify 25

Score . . . . . .

TEST 2. SYNONYMS

Mark the answer space which has the same number as the word which has the SAME or most nearly the same meaning as the beginning word of each line.

SAMPLE. correct — 1 neat 2 fair 3 right 4 poor 5 good . . . . . .

1 2 3 4 5

1. comic — 1 clumsy 2 laughable 3 universal 4 tricky 5 peculiar 1
2. hazardous — 6 adventurous 7 hard 8 annoying 9 speedy 10 dangerous 2
3. comfort — 1 entreat 2 console 3 pity 4 anger 5 discourage 3
4. equip — 6 decorate 7 establish 8 surround 9 load 10 furnish 4
5. introductory — 1 social 2 advisory 3 transitory 4 preliminary 5 internal . . 5
6. writhe — 6 squeal 7 twist 8 split 9 hurt 10 crawl 6
7. trivial — 1 amusing 2 rare 3 unimportant 4 detailed 5 uneven 7
8. evade — 6 vacate 7 invade 8 shun 9 hide 10 desist 8
9. denounce — 1 beguile 2 detest 3 inform 4 discover 5 condemn 9
10. opposed — 6 censored 7 adverse 8 involved 9 oppressed 10 morose . . 10

2

11. counsel — 1 quarrel 2 yield 3 advise 4 assemble 5 represent 11
12. abhor — 6 detest 7 fear 8 avoid 9 defy 10 disgust 12
13. depict — 1 vanish 2 slump 3 portray 4 edit 5 fabricate 13
14. expel — 6 repel 7 eject 8 injure 9 expend 10 depart 14
15. encumbrance — 1 contrivance 2 memory 3 burden 4 saddle 5 prison 15
16. docile — 6 facile 7 cozy 8 agile 9 submissive 10 intractable 16
17. quell — 1 inquire 2 dispel 3 instill 4 quest 5 subdue 17
18. abandon — 6 flee 7 escape 8 refuse 9 forsake 10 refrain 18
19. jubilant — 1 exultant 2 judicious 3 playful 4 pleasant 5 jeweled 19
20. hoax — 6 danger 7 deception 8 persuasion 9 revelation 10 mischief 20
21. curdle — 1 coagulate 2 spoil 3 snuggle 4 condense 5 churn 21
22. reverence — 6 revenge 7 relevance 8 obedience 9 veneration 10 mercy 22
23. incite — 1 instigate 2 revolt 3 announce 4 disrupt 5 consume 23
24. boldness — 6 hypocrisy 7 ferocity 8 audacity 9 frankness 10 confidence 24
25. appease — 1 praise 2 pique 3 entice 4 gladden 5 placate 25

Score . . . . . .

TEST 5. ANALOGIES

Study the samples carefully.

SAMPLES.

Ear is to hear as eye is to
1 cry 2 glasses 3 spy 4 wink 5 see 1 2 3 4 5

Hat is to head as shoe is to
6 arm 7 leg 8 foot 9 fit 10 glove 6 7 8 9 10

DO THEM ALL LIKE THE SAMPLES.

1. Zoo is to animals as aquarium is to
1 birds 2 fish 3 bees 4 statues 5 butterflies ..... 1 — 1 2 3 4 5
2. Linoleum is to floor as sheet is to
6 cotton 7 piano 8 blanket 9 linen 10 bed ..... 2 — 6 7 8 9 10
3. Food is to hunger as water is to
1 desert 2 thirst 3 quench 4 drink 5 milk ..... 3 — 1 2 3 4 5
4. Add is to subtract as multiply is to
6 arithmetic 7 increase 8 fraction 9 add 10 divide ..... 4 — 6 7 8 9 10
5. Stone is to marble as wood is to
1 brick 2 soft 3 cut 4 oak 5 pile ..... 5 — 1 2 3 4 5
6. Abide is to depart as stay is to
6 play 7 leave 8 away 9 over 10 home ..... 6 — 6 7 8 9 10
7. Author is to book as artist is to
1 painter 2 brush 3 picture 4 easel 5 paint ..... 7 — 1 2 3 4 5
8. You is to yours as me is to
6 his 7 ours 8 mine 9 theirs 10 my ..... 8 — 6 7 8 9 10
9. Singing is to opera as dancing is to
1 masquerade 2 orchestra 3 movie 4 drama 5 ballet ..... 9 — 1 2 3 4 5
10. Shell is to nut as skin is to
6 hull 7 animal 8 white 9 soft 10 cover ..... 10 — 6 7 8 9 10

5

11. Cub is to bear as gosling is to
1 fox 2 grouse 3 goose 4 rabbit 5 duck ..... 11 — 1 2 3 4 5
12. Liberty is to freedom as bondage is to
6 slavery 7 free 8 suffer 9 serf 10 revolution ..... 12 — 6 7 8 9 10
13. Imitate is to copy as invent is to
1 inventory 2 copyright 3 originate 4 machine 5 patent ..... 13 — 1 2 3 4 5
14. 1 is to 3 as 9 is to
6 (*18*) 7 (*27*) 8 (*36*) 9 (*45*) 10 (*81*) ..... 14 — 6 7 8 9 10
15. Complex is to simple as hard is to
1 tough 2 work 3 easy 4 smooth 5 brittle ..... 15 — 1 2 3 4 5
16. Tree is to forest as person is to
6 women 7 couple 8 human 9 crowd 10 men ..... 16 — 6 7 8 9 10
17. City is to mayor as army is to
1 soldier 2 navy 3 private 4 admiral 5 general ..... 17 — 1 2 3 4 5
18. Wolf is to sheep as cat is to
6 milk 7 fur 8 kitten 9 mouse 10 dog ..... 18 — 6 7 8 9 10
19. $\frac{4}{3}$ is to $\frac{1}{3}$ as 28 is to
1 (*7*) 2 (*14*) 3 (*33*) 4 (*34*) 5 (*43*) ..... 19 — 1 2 3 4 5
20. Hog is to bristles as snake is to
6 fangs 7 scales 8 venom 9 coil 10 rattle ..... 20 — 6 7 8 9 10
21. Seldom is to never as little is to
1 none 2 neither 3 small 4 often 5 large ..... 21 — 1 2 3 4 5
22. Day is to 365 as week is to
6 (*7*) 7 (*31*) 8 (*48*) 9 (*52*) 10 (*60*) ..... 22 — 6 7 8 9 10
23. Corrupt is to depraved as sacred is to
1 hallowed 2 Sunday 3 depressed 4 Bible 5 prayer ..... 23 — 1 2 3 4 5
24. Square is to cube as circle is to
6 round 7 circumference 8 sphere 9 dice 10 line ..... 24 — 6 7 8 9 10
25. Thermometer is to temperature as metronome is to
1 intensity 2 weight 3 distance 4 pressure 5 time ..... 25 — 1 2 3 4 5

Score .....

TEST 3. LOGICAL SELECTION

Mark the answer space which has the same number as the word which tells what the thing ALWAYS has or ALWAYS involves.

SAMPLE. A cat always has
1 kittens 2 spots 3 milk 4 mouse 5 hair . . . . . .

1. An orchestra always has
1 violinists 2 piano 3 musicians 4 saxophone 5 singers 1
2. A museum always has
6 visitors 7 minerals 8 collections 9 guides 10 paintings 2
3. School always involves
1 children 2 students 3 arithmetic 4 geography 5 sports 3
4. A box always has
6 contents 7 wood 8 lid 9 hinge 10 depth 4
5. Contentment always involves
1 devotion 2 position 3 satisfaction 4 elation 5 recognition 5
6. A newspaper always has
6 pictures 7 editor 8 puzzles 9 fiction 10 cartoons 6
7. A wheel always has
1 circumference 2 spokes 3 tire 4 wood 5 metal 7
8. A policeman always has
6 club 7 cap 8 beat 9 uniform 10 authority 8
9. A nation always has
1 states 2 colonies 3 seaports 4 laws 5 navy 9
10. Night always has
6 stillness 7 moon 8 clouds 9 ghosts 10 hours 10

3

11. A ship always has
1 engine 2 guns 3 hull 4 passengers 5 freight 11
12. A message always involves
6 telepathy 7 messenger 8 speech 9 communication 10 writing 12
13. Discipline always involves
1 revenge 2 anger 3 morale 4 whipping 5 training 13
14. A bottle always has
6 hollowness 7 label 8 cork 9 glass 10 transparency 14
15. Anxiety always involves
1 awe 2 grief 3 insomnia 4 uneasiness 5 discouragement . . 15
16. Compromise always involves
6 respect 7 friendship 8 adjustment 9 law 10 violation 16
17. An heir always has
1 money 2 lawyer 3 heirlooms 4 property 5 predecessor . . . 17
18. An invention always involves
6 usefulness 7 originality 8 patent 9 value 10 imitation 18
19. A dance always has
1 music 2 partners 3 rhythm 4 audience 5 costume 19
20. A debt always involves
6 interest 7 creditor 8 mortgage 9 payment 10 worry 20
21. Rebuke always involves
1 criticism 2 help 3 resignation 4 postponement 5 despair . . 21
22. Admiration always involves
6 affirmation 7 generosity 8 flattery 9 esteem 10 love 22
23. Annihilation always involves
1 surprise 2 destruction 3 pain 4 punishment 5 vengeance 23
24. Abhorrence always involves
6 aversion 7 rage 8 fear 9 irreverence 10 nausea 24
25. Ostentation always involves
1 simplicity 2 modesty 3 wealth 4 display 5 perfection 25

Score . . . . . .

TEST 4. CLASSIFICATION

In each line below, four of the words belong together. Pick out the ONE WORD which does not belong with the others, and mark the answer space bearing its number.

SAMPLES.

1 dog 2 cat 3 horse 4 chicken 5 cow 4

6 hop 7 run 8 stand 9 skip 10 walk 8

1. 1 Catholic 2 Methodist 3 Presbyterian 4 Republican 5 Baptist 1
2. 6 damp 7 wet 8 moist 9 soggy 10 soft 2
3. 1 telegraph 2 train 3 automobile 4 bicycle 5 boat 3
4. 6 often 7 seldom 8 safely 9 always 10 rarely 4
5. 1 oats 2 rye 3 wheat 4 clover 5 barley 5
6. 6 cello 7 harp 8 drum 9 violin 10 guitar 6
7. 1 Scottie 2 Holstein 3 Collie 4 Shepherd 5 Spitz 7
8. 6 digestion 7 smell 8 sight 9 hearing 10 taste 8
9. 1 pepper 2 cinnamon 3 nutmeg 4 pickle 5 mustard 9
10. 6 chapel 7 temple 8 tabernacle 9 cathedral 10 casino 10

4

11. 1 reason 2 pity 3 joy 4 anger 5 fear 11
12. 6 arithmetic 7 geometry 8 history 9 trigonometry 10 algebra 12
13. 1 mosquito 2 ladybug 3 gnat 4 snail 5 beetle 13
14. 6 grosbeak 7 swallow 8 oriole 9 lark 10 gazelle 14
15. 1 nail 2 brad 3 awl 4 staple 5 tack 15
16. 6 large 7 tall 8 high 9 short 10 low 16
17. 1 priest 2 organist 3 minister 4 rabbi 5 bishop 17
18. 6 devotion 7 adoration 8 reverence 9 avarice 10 admiration 18
19. 1 pine 2 fir 3 maple 4 cedar 5 spruce 19
20. 6 Christ 7 Caesar 8 Moses 9 Mohammed 10 Confucius 20
21. 1 hither 2 recent 3 whence 4 near by 5 down 21
22. 6 lead 7 brass 8 iron 9 tin 10 copper 22
23. 1 verdict 2 testimony 3 subpoena 4 court 5 evidence 23
24. 6 inherit 7 lend 8 beg 9 borrow 10 earn 24
25. 1 moreover 2 besides 3 also 4 furthermore 5 however 25

Score . . . .

TERMAN–McNEMAR TEST OF MENTAL ABILITY

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MANUAL OF DIRECTIONS

I. Description of the Tests

The Terman Group Test of Mental Ability, which was first published in 1920, was not only one of the earliest group tests but also one of the first tests based upon an item analysis. Perhaps its fundamental soundness is indicated by its widespread and continued usage — more than 11,000,000 copies have been distributed during the period 1920–1941. This test has now been completely revised and will be known hereafter as the Terman-McNemar Test of Mental Ability.

The test is designed primarily for use in Grades 7 through 12, although it may be used also in Grade 6 and with first-year college students. There are two forms, C and D, each composed of seven subtests and 162 items.

The several considerations which have led to and influenced the revision should make the new forms definitely superior to the original. The changes may be briefly mentioned here. (1) Two-choice questions have been eliminated in favor of the more reliable multiple-choice type with five alternatives except for the Best Answer test, which has four. (2) The revised forms are so designed as to permit more rapid scoring by a perforated key;[1] they may also be used with separate answer sheets for scoring on the International Test Scoring Machine. (3) More homogeneous material has been used in order to have a test more highly saturated with a common factor or ability. Thus, the exclusion of the arithmetical and numerical subtests means that the scores of any two individuals are more nearly comparable qualitatively; i.e., they lie along the same continuum. This continuum may be characterized as that of general verbal intelligence. This particular change has, of course, been prompted by recent developments in factor analysis. (4) Instead of ten subtests, each form of the new test contains seven: Information, Synonyms, Logical Selection, Classification, Analogies, Opposites, and Best Answer. It will be noted that Sentence Meaning, Mixed Sentences, Arithmetic, and Number Series have been dropped, and that the former Same-Opposites test has been replaced by two subtests, Synonyms and Opposites. (5) An attempt has been made to use equivalent materials in the two forms, and within each subtest the use of a word either as a stimulus or response more than once has been reduced to the vanishing point.

[1] The arrangement for scoring is covered by Patent No. 1,586,628 originally taken out by Charles A. Lauterbach.

II. Construction of the Tests

Item analysis. In constructing the new forms, as many of the items from the old forms as could be made suitable by revision were utilized. Additional items were made up until enough were available, after critical examination by seven competent persons and after careful editing, for three experimental forms of the same length and general make-up as the present Forms C and D. These forms were administered to experimental groups in Grades 7, 9, and 11, each pupil taking all three forms and practice effect being taken care of by rotation in the order of administration. Ample time limits were allowed for even the slowest. Enough pupils were tested so as to yield 400 cases, with complete data, for each grade. The results for these 1200 pupils were used as the basis of the subsequent item analysis.

On the assumption that the validity of an item depends partly upon the extent to which it differentiates between groups of different maturity levels, those items were eliminated which did not show successive increments from Grades 7 to 9 to 11, in the percentages giving correct responses. The per cent passing a test item was considered as the item difficulty for each grade. The average per cent passing an item for the three grades was used as the final measure of item difficulty. As a further basis for eliminating the less valid and unsatisfactory items, the tetrachoric correlation of each

Published by World Book Company, Yonkers-on-Hudson, New York, and Chicago, Illinois

Edition b

PRINTED IN U.S.A.

item with the total score based on all three test forms was computed for each grade separately. Three such coefficients were available for all items except those which were so easy for the 11th grade and the ones so difficult for the 7th grade as to yield dichotomies too extreme for stable tetrachoric correlation coefficients. The average tetrachoric for the three grades was taken as the final item validity or measure of internal consistency. Items yielding low average validity coefficients were eliminated from further consideration. No item was retained which yielded an average tetrachoric correlation of less than .30, and only 10 per cent of the final items have validities of less than .40. The average coefficient for all retained items was .53.

The final allocation of the items to the two forms was made on the basis of item difficulty and item validity, the items within each subtest and for the total test being matched in the two forms for difficulty and validity indices. The respective averages of all the difficulty values for Forms C and D were 56.24 per cent and 56.26 per cent, while those of the validity coefficients were .5308 and .5307. Since the matching also produced highly similar distributions of difficulty indices and distributions of validity coefficients for the two forms, the statistical comparability of Forms C and D has been assured.

The items within each subtest have been arranged in the order of difficulty indicated by the difficulty indices. This fact, coupled with ample time allowance for each subtest, means that the new forms, like the old, are essentially power tests — any pupil who has not finished a subtest within the set time limit would not likely increase his score if given additional time. The time needed for administering either form, including time for directions, is about 48 minutes.

Perhaps a word should be said here for the benefit of the non-statistically-minded test user. If the types of subtests included in the Terman-McNemar revision are acceptable as valid measures of important mental abilities, a matter that is hardly open to debate in view of the abundance of experience favoring this assumption, then the above data are convincing evidence of the essential soundness of the content of the new tests.

Comparability of old and new forms. When an established test such as the Terman Group Test of Mental Ability is revised and new norms established, it is essential to provide the means by which the scores on the original test can be interpreted in terms of the new norms. To be able to do this, it is necessary to determine the equivalence of scores on the old and new tests. To establish this equivalence, a carefully controlled equating experiment was carried out involving the administration of old Form A and new Form C to all students in Grades 7 through 12 in Portsmouth, New Hampshire. Approximately 1400 cases spread fairly equally over the grade range were included in this study. Practice effect was equalized by giving Form A first to a random half of each grade group; the remaining pupils took Form C first. A few days later the second test was given. Those who took Form A at the time of the first testing now took Form C, and vice versa. On the basis of these data the equivalent raw scores on the old and new tests were determined. These data are summarized in Table 5, with the exception that standard scores on the new test have been substituted for raw scores.

Comparability of the new forms. As indicated earlier, new Forms C and D were paired for difficulty in terms of the average per cent passing each item. As a final check on the equality of forms and also to determine reliability coefficients, another controlled rotated group experiment was carried out. The testing was done in Concord, New Hampshire, and approximately 1500 students in Grades 7, 9, and 11 were included. The analysis of these data showed the two forms to be completely comparable throughout the range of scores.

Reliability. The reliability of a test is the stability of the measures it yields. A completely unreliable test would be one which yielded measures so variable that just as good results could be obtained by drawing lots; a completely reliable test would be one in which a single application of the instrument yielded the individual's "true" score. Reliability is a function of the test itself — that is, the number and kind of items presented to the person being tested under standard conditions. It has nothing to do with the norms established for the test. In other words, a completely reliable test might give misleading results if the norms were improperly established.

Various methods of expressing the reliability of a test are in common use. Three of the commonest are the split-half reliability coefficient, the interform reliability coefficient, and the probable error of a test score. All three methods have distinct advantages and all three methods have been employed in the case of the Terman-McNemar Test of Mental Ability for the sake of completeness.

1. The split-half method. The split-half reliability coefficient is obtained by scoring all the odd-numbered items and all the even-numbered items separately. By doing this the test is broken into two parts which are presumably equal in every sense. Even the effects of fatigue, ennui, and

practice are evenly shared under these circumstances. The two scores thus obtained are then correlated, and the obtained coefficient is "corrected" by means of a statistical formula to estimate the reliability coefficient of the full-length test.

2. The inter-form method. In the case of the inter-form reliability coefficient two presumably equivalent forms of the test are given to the same children, with an interval varying from one day to a fortnight between the testing periods. The obtained scores on the two tests are then correlated to find the reliability coefficient. It is readily seen that reliability coefficients obtained in this manner are influenced by the equivalence of the two test forms (not in the sense of difficulty, but in the sense of comparable content) and the variations in the total environment including the person tested. Consequently, the inter-form reliability coefficient is almost always lower than the corrected split-half reliability coefficient. On the other hand, it has the virtue of representing with more veracity the situation which the practical school administrator most often faces — namely, the question of how much variation (not due to practice) must be expected when a different form of a test is used.

Both types of reliability coefficients are difficult for the novice to interpret. They vary in accordance with the range of talent tested, and unless the group on which the coefficients are based is clearly specified, the coefficients themselves are of doubtful significance. Perhaps the most unambiguous population on which to base such coefficients is a random sample of a single age group. The split-half reliability coefficient for the Terman-McNemar Test of Mental Ability was .96 when determined on 279 cases in Grades 7 through 9 in the carefully controlled experiment in Portsmouth, New Hampshire, in which Forms A and C were equated. The inter-form reliability was .95 when determined on 239 cases in Grades 7 and 9 in the Concord, New Hampshire, experiment in which Forms C and D were equated. When the reliability coefficients so obtained are corrected for range to give the coefficient for age 14 (13–6 to 14–5) which was basic in setting up the standard score scale, the reliability by both methods is .96. The reliability coefficients for the other age ranges were checked and found to vary only slightly from the 14-year value.

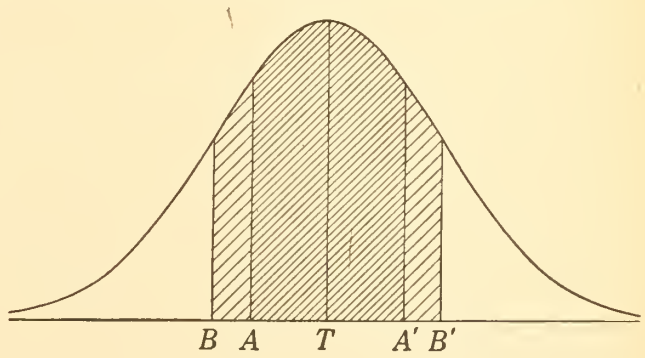
3. Probable Error of Measurement. The third method of reporting the reliability of a test is to give the Probable Error of Measurement.[1]

[1] The P.E.$_M$ is given by the formula P.E.$_M$ = $.6745\,\sigma_1\sqrt{1 - r_{11}}$, where σ_1 = the standard deviation of the obtained distribution of scores and r_{11} is the reliability coefficient. To obtain a better idea of the meaning of this value, one must realize that an individual's "true" score is never known from a single application of any test.

One advantage of the Probable Error of Measurement is that it is independent of the range of talent upon which it is based, whereas the reliability coefficient is not. Another is that it makes it possible for us to estimate whether the difference between any two scores is a statistically reliable difference. The Probable Error of Measurement for the Terman-McNemar Test of Mental Ability is approximately 2.2 standard score points for the entire age range covered by the test.

Validity. In the early days of the development of group tests of mental ability an attempt was made to validate them by correlating the scores with teachers' marks. As has been pointed out many times in the intervening years this procedure is unsatisfactory because of the serious shortcomings in teachers' judgments of mental ability. The best evidence of the validity of the Terman test is to be found in its successful use over the period of years since the test was first issued. Many instances may be cited where the Terman test has been used with great success in guidance and administration. In some situations where the use of the Terman test with entering high school students has been made a standard practice, it has been found that year after year those students who were

The "true" score is the average of an infinite number of test scores derived by repeated applications of a test to the same individual, assuming no practice effects. It is obvious that such a "true" score can never be obtained in actual practice. The Standard Error of Measurement is an estimate of the standard deviation of a distribution of such theoretical scores for a given individual. It is valuable because it gives us some idea of the fluctuation which we can expect in obtained scores due to random errors. In the following graph the curve represents a distribution of the obtained, fallible test scores around the "true" score, *T*, of an individual.



The distance *TB* or *TB′* represents the standard deviation of this theoretical distribution. This is the *Standard* Error of Measurement. The distance *TA* or *TA′* represents the *Probable* Error of Measurement, which is .6745 times the Standard Error. Fifty per cent of the scores in such a distribution would fall between plus and minus 1 PE. The most probable position in such a distribution for any obtained score is at the mean; as one moves outward toward the tails of the distribution the likelihood that the obtained score would fall at any given point decreases rapidly. Although it is not strictly accurate, it is helpful to say that the chances are 50–50 that an obtained score will fall somewhere between points *A* and *A′*, or 68 in 100 that it will fall between *B* and *B′*. Any error in such a statement is on the side of conservatism.

graduated with honors were those who made scores in the highest range of the test. The correlation of the revised test with the original test is .91, which indicates that the new test can be considered to be measuring essentially the same basic abilities covered by the original forms.

If one is willing to admit that the abilities measured by this test as a whole are important abilities for success in school and, to a certain lesser degree, in life, then it becomes reasonable to talk about the validity of the component parts of the test. Evidence regarding this has already been presented in the section on the construction of the test, where it was pointed out that 90 per cent of the items had tetrachoric correlations with the total test of .40 or over and the average tetrachoric on both forms was .53.

III. Standardization

The standard score scale. In order to have adequate mental or educational measurement, a score scale must have (1) a single origin and (2) comparable units in all parts of the scale. It is generally recognized that raw scores do not insure comparability at all points along a scale. A difference of ten raw score points in one part of a scale may represent a different amount of ability from ten raw score points in another part of the scale. Similarly, a difference of ten raw score points at an early age may represent quite a different amount of intellectual growth from ten raw score points at a later age. For the Terman-McNemar Test of Mental Ability, a standard score scale has been devised which uses the median of the 14-year age group of the national standardization population as the origin and the standard deviation of this age group, arbitrarily made 16 points, as the unit of measurement. Scores on this scale for all age groups are thus measured from a single origin and provide comparable units throughout all parts of the scale.

After examining the distributions of raw scores for all ages, age 14 was chosen as the most unselected group for such scaling. Age 14 included 1615 cases from 13 years 6 months to 14 years 5 months inclusive; this was a 10 per cent random sample of the national population tested. Practically all the children of this age should be in the grade range tested; i.e., Grades 6 through 12. The total raw scores for this age group were distributed and the cumulative per cents getting respective raw scores were plotted on Otis Normal Percentile Charts [1] which made it possible very quickly to convert the raw scores into standard scores which would yield a normal distribution. The standard score equivalents of the raw scores were read from the chart, assuming a standard deviation of 16 for the standard scores at age 14 and arbitrarily calling the median of the 14-year-olds a standard score of 100. (The raw score standard deviation for age 14 was 26.74; the raw score median for this age was 76.00.) This gives a single standard score scale measured from the median of the 14-year-olds in units of the standard deviation of the 14-year-olds which can be used for the whole range of the test. The underlying assumption of such a scale is that the distribution of the scores in the abilities tested would be normally distributed in an unselected population if you had equal units in all parts of the scale. The stability of the standard scores so determined should be assured, since they were determined on a 10 per cent random sample out of a total population of 16,000 14-year-old students in all parts of the United States.

Establishment of norms. Norms for the Terman-McNemar Test of Mental Ability have been determined in the customary way; i.e., by finding the median standard score for successive age groups, plotting standard score against age, and drawing a smoothed norm line through the plotted points. Corrections for selection were made for ages 11, 12, 17, 18, and 19 before this norm line was drawn. About one half of the communities in the national standardization program furnished information on per cent of drop-outs during the period 1934–1941 in their schools, to aid in making such a correction. From this corrected norm line representing unselected age populations, mental ages corresponding to months of chronological age from 10 years 0 months to 19 years 11 months were determined. These mental age norms are presented in Table 2.

The norms for this test were established through a cooperative national testing program sponsored by World Book Company in which approximately 190,000 tests were distributed to 200 [1] communities in 37 states and 307 parochial schools in the diocese of Philadelphia. To facilitate calculations, only a 10 per cent random sample of the test booklets was called in for setting up the norms. To insure the randomness of such a sample, communities were not notified of the serial numbers to be returned

[1] These Normal Percentile Charts proved extremely helpful in many phases of the statistical work involved in the Terman-McNemar standardization. The Chart and its uses are described in the Manual of Directions for the Otis Normal Percentile Chart and in Test Method Help, No. 4, Statistical Methods Applied to Test Scores, both published by World Book Company.

[1] Not all communities returned their tests in time to be included in the normative population. The norms are based on the results from 148 communities in 33 states where answers were recorded in the test booklets; data from the remaining communities including several communities where answers were recorded on separate answer sheets are in the process of analysis.

until after the tests were administered and scored. Each community tested all of the pupils in at least three consecutive grades in order to obtain at least one approximately unselected age sample from it. About one half of the communities tested more than three grades while one fourth of them tested the whole grade range. The 10 per cent random sample of test booklets was returned to World Book Company where all scoring and the calculation of chronological ages from verified birth dates were checked before the data were punched in Hollerith cards. Distributions of raw scores for separate age groups were run off; these were the basic data for setting up the standard score scale and the norms. The wide geographical distribution of the coöperating communities and the fact that all students in at least three consecutive grades were tested in each community should insure a cross section of the school population in the grades involved in the norms.

IV. General Directions for Administering

The test should be given in a room where a quiet atmosphere prevails both within and without. It should be administered as if it were an interesting lesson or activity, but without preliminary counsel by the teacher or examiner. Any influences which might cause tenseness and anxiety should be carefully avoided. Provision should be made to guard against interruptions of any kind. Some examiners post on the door a card reading, "Examination. Keep out!" It is best that each pupil have two sharpened pencils and an eraser and that an extra supply of pencils be on hand in case of need.

To obtain reliable results, the examiner should read the entire contents of these directions and be wholly familiar with them before attempting to give the test. The wording of the directions has been given careful study. It is intended that the directions be precise enough for all children to understand what they are to do; the person administering the test should follow these directions exactly.

Time limits are provided for the separate subtests. They should be adhered to within a margin of a few seconds. A regular watch will serve for timing; a stop watch is unnecessary. The examiner should not permit the idea of time limit to create a feeling of pressure or nervousness on the part of the pupils. What is desired is each child's best response to the test. The time limits on this test are intentionally generous, as it was the desire of the authors to make this a power test rather than a speed test. Consequently it may sometimes occur, especially in above-average groups, that an entire class will finish a subtest before the time for it has expired. In such a situation the examiner should continue with the directions for the next subtest.

V. Specific Directions for Administering

Each of you will be (or has been) given a test booklet. Don't open the test booklet until told to do so. Fill in your name and the other blanks on the front page of the booklet. (Pause for about $1\frac{1}{2}$ minutes.)

If the regular edition is being used, say:

Attention! Listen carefully. I want you to understand the directions so that you can make a high score. Let us now look at the front page in order to see how the answer spaces should be marked to indicate the correct answers.

If the separate answer sheet for machine scoring is being used, substitute the following for the paragraph above: [1]

Each of you will be (or has been) given a test booklet and a separate answer sheet. *Do not make any marks on the test booklets.* Fill in your name and the other blanks on the front side of the answer sheet. (Pause for about $1\frac{1}{2}$ minutes.)

Attention! Listen carefully. I want you to understand the directions so that you can make a high score. Now take your answer sheet and slip it under the edge of the test booklet so that the column of answer spaces on the right-hand side of the answer sheet marked SAMPLES is alongside the front page like this. (Show by holding up a test booklet with the answer sheet in the correct position.) **The arrows in the SAMPLES column of the answer sheet should point directly toward the arrows on the test booklet.**

After making sure that every one has properly articulated his test booklet and answer sheet, continue with the regular directions.

Look at the first example: "Steel is made from lead, iron, tin, copper, zinc." The correct answer, *iron*, is number 2; so the second answer space has been blackened. Now you mark the correct answers for the remaining samples in the same way. A horse always has (Pause) ***hoofs;* so blacken the space numbered 9. A quart is one fourth of a** (Pause) ***gallon;* so blacken the 1st space.**

In taking this test, you are first to decide which answer is correct, and then blacken with a *soft pencil* the answer space which is numbered the same as your choice for the correct answer. Make your mark as long as the pair of lines, and move the pencil up and down firmly to make a heavy black line. If you change your mind, erase your first mark completely.

[1] It is assumed that the group has had previous experience in marking machine-scored answer sheets; if this is not the case, a practice test should be given first. Furthermore, we strongly recommend that the special pencils using the electrographic lead be used for marking the answer sheets to insure accurate machine scoring.

There is a row of answer spaces for each question. Be sure that the space you mark is in the proper row. If you omit a question, be sure to skip its row of answer spaces.

Now open the booklet to Test 1. Let us read the directions: "Mark the answer space which has the same number as the word that makes the sentence true, as shown in the sample." (Pause.) Ready — GO.

After 6 minutes, at ____ o'clock,[1] say: STOP. Turn the page to Test 2. Let us read the directions: "Mark the answer space which is numbered the same as the word which has the same or most nearly the same meaning as the beginning word of each line, as shown in the sample." (Pause.) Ready — GO.

After 6 minutes, at ____ o'clock,[1] say: STOP. Turn the page to Test 3. Let us read the directions: "Mark the answer space which has the same number as the word which tells what the thing always has or always involves, as shown in the sample." (Pause.) Ready — GO.

After 6 minutes, at ____ o'clock,[1] say: STOP. Turn over the page and turn the booklet around to Test 4.

If the separate answer sheet is being used, say, "Turn the answer sheet over to the column at the right marked Test 4. Be sure that the arrows on the test booklet point directly to the arrows on the answer sheet.

Let us look at the directions: "In each line below, four of the words belong together. Pick out the one word which does not belong with the others, and mark the answer space bearing its number, as shown in the two samples." (Pause.) Ready — GO.

After 6 minutes, at ____ o'clock,[1] say: STOP. Turn to Test 5. Study the two samples carefully. (Longer pause.) Ready — GO.

After 6 minutes, at ____ o'clock,[1] say: STOP. Turn to Test 6. Let us read the directions: "Mark the answer space which has the same number as the word which is opposite, or most nearly opposite, in meaning to the beginning word of each line, as shown in the sample." (Pause.) Ready — GO.

After 6 minutes, at ____ o'clock,[1] say: STOP. Turn to Test 7. Read each statement and mark the answer space which has the same number as the answer which you think is best, as shown in the sample. (Pause.) Ready — GO.

After 4 minutes, at ____ o'clock,[1] say: STOP. Close your booklet. Collect the papers immediately.

If the separate answer sheet for machine scoring is being used, collect the test booklets, telling the pupils to retain the answer sheets. Then tell the pupils to go over each mark on the answer sheet, making a black shiny mark, and to erase any stray marks not intended for correct answers.

[1] Unless a stop watch is used, write the finishing time for each test in the space provided; e.g., 10:06.

VI. Directions for Scoring

The need for accuracy in the scoring of standardized tests cannot be overemphasized. All scoring should be checked, especially if the test results are to be used for individual guidance.

Each operation in the scoring should be made as nearly mechanical as possible. The most efficient scoring is done when the process becomes very nearly automatic.

The Terman-McNemar Test is scored by means of a patented scoring arrangement which does away with the necessity of marking with pencil each item right or wrong. To score a test booklet, a perforated scoring key (which is included in each package of tests) is positioned successively over the answer spaces for each of the subtests. When the key is properly placed, only the correct answers appear through perforations in the key.

The specific steps to follow in scoring are:

1. Open the test booklet to Test 1. First scan the answer spaces rapidly to note any items which are double marked. The pupils have been instructed to put only one mark in any row of spaces, but occasionally there will be found two or more marks. Wherever two or more answer spaces for one question have been marked in spite of the precise directions, the spaces should be crossed through with a colored pencil so that an answer correct only by chance will not receive credit.
2. Superimpose the key for Test 1 on the Test 1 answer spaces so that the heavy black arrow in the center of the right-hand margin of the test page shows through the large opening in the center of the proper column of the key and the arrows on the test booklet and the key are point to point, as illustrated: **1➔←1**. Adjust the key with a slight rotary motion so that the answer spaces on the test paper show through the perforations of the key. This is quickly done after short practice.
3. Count the number of correct responses — i.e., the number of black marks that appear through the openings of the key. The number of correct responses is the score. Record this score in the space provided at the foot of the page, preferably with a colored pencil.
4. Each of the subtests should be scored in exactly the same way. In each case the score — i.e., number right — should be recorded in the space provided at the foot of the test page.
5. To insure accuracy, it is highly desirable to have all papers rescored, preferably by a

second person working independently. If this is not possible, it is wise to rescore those tests on which the scores fall in the lowest 25 per cent of the group.

6. Transfer the raw scores to the grid on the title page and sum them to obtain the total score.

VII. Special Directions for Machine Scoring

It is assumed here that all persons attempting to score the Terman answer sheet on the International Test Scoring Machine will have thoroughly familiarized themselves with the scoring techniques described in the various International Business Machines publications, particularly as they concern the manipulation of the machine itself. To insure scoring of satisfactory accuracy, the following steps are suggested:

1. Be sure that the machine is properly adjusted according to the manufacturer's directions.
2. Scan each answer sheet for double-marked items and for stray pencil marks which might affect the score. Double-marked items should be completely erased, as should any stray marks, no matter how slight, which fall within the sensing spaces. If answer sheets are badly marked up, it is easier to score them by hand than to adequately scan and clean them.
3. As the answer sheets are being scored on the machine, a check scorer should rescore a certain proportion of the sheets by hand. It is suggested that the check scorer work along with the machine operator, rescoring a random selection of the papers as they come from the machine.
4. The raw scores may be entered directly on the Class Record in the columns provided for this purpose. The total raw scores (number right) may be translated into standard scores from the table given at the right-hand side of the Class Record blank; these standard scores may be recorded in the proper column of the Class Record blank.

VIII. Interpretation of Scores

Need for means of interpretation. Raw scores on a test, that is, the number of items a pupil is able to answer correctly, have only limited meaning. They serve to arrange the individuals who have taken the test in rank order, but for all practical purposes this is the limit of their usefulness. For example, it is not possible to compare raw scores on one test with raw scores on another, even though both tests have the same number of items. As a general rule, raw scores are not even comparable from one part of the range of scores to another. For example, the difference between a score of 5 and a score of 10 is not the same as the difference between a score of 50 and a score of 55. Because of this lack of comparability, it is necessary to interpret the raw scores in some way. Traditionally, raw scores on intelligence tests have been interpreted in terms of mental ages and IQ's.

Disadvantages of traditional mental ages and IQ's. While mental ages and IQ's represent a definite step forward in comparison with total score as a means of interpreting test results, they have, especially at the upper age levels, some very serious disadvantages which are not always appreciated. Let us first consider mental ages.

A mental age is the age for which a given intelligence test score is the norm or average. Our first limitation grows out of the fact that most intelligence tests are applicable only over a very narrow range of ages. For example, the Terman-McNemar test is primarily intended to be used with pupils from 12 to 18 years inclusive. In standardizing the test, the grade range tested was extended downward one grade below the usual grades in which this test is used. Even so, mental ages can be taken literally from the data only for this limited range; values above and below these points must be determined by extrapolation, that is, by arbitrarily extending the line of relation between score and age. This may not be serious if data to supplement the test scores for lower and higher age groups are available, making it possible to estimate what the average score of these more extreme ages would be. However, really adequate information of this sort is rarely obtainable. The seriousness of this limitation is not truly appreciated until one realizes that a very small proportion of the total range of scores on a test will fall between the average score of the lowest and that of the highest age for which unselected groups are available. For example, the average score of 12-year-old children in terms of number right on the Terman-McNemar test is 59, while the average score for 16-year-old children is 93. The difference between these two values, or 34 points of score, represents only a little over one fifth of the total range of raw scores on the test. In other words, nearly four fifths of all of the scores on the test would have mental ages assigned by extrapolation.

There is another even more serious difficulty. Mental ages do not represent comparable units from one part of the scale to another. An essential condition for equality of mental age units would be that the increment in score in terms of some truly equal scale should be the same from one age to another. Whenever test scores having some

claim to comparability are plotted against age, the resulting line is not straight, but tends to bend off with a characteristic negative acceleration. This norm line or growth curve reaches a maximum at some point in the upper teen ages or early twenties, but just where this maximum occurs is practically impossible to determine because of the difficulties in testing unselected groups of individuals in the upper teen age and young adult level.

Let us consider now some of the disadvantages of the traditional ratio IQ which is obtained by dividing the mental age by the chronological age. Theoretically, one of the chief virtues of the IQ is its constancy. Actually, however, for the IQ to be constant, certain conditions must be fulfilled which in actual fact rarely do obtain. In the first place, the increase in score in terms of absolute units must be equal from one age to another. We can see how absurd such an assumption is if we realize that it assumes mental power increasing at a constant rate with increasing chronological age throughout the lifetime of an individual. This of course is quite contrary to our practical experience. It is just as normal for individuals to reach a maximum of their mental powers as to reach a maximum of physical stature. Thus we are reduced to the dilemma that the IQ, defined as the ratio of MA/CA, cannot be constant unless the increment in score from one age to another is constant, and the increment in score in terms of any absolute units cannot be constant without assuming the absurd situation of mental growth continuing at a constant rate throughout the lifetime of an individual.

However, there is another equally serious limitation in the IQ. The magnitude of the IQ will vary from one test to another, as the test content differs. It seems reasonably well established now on the basis of experimental evidence that there are various aspects of mental ability. The rate of growth and the level at which the individual reaches maturity is not the same for all mental traits. This is reflected in the different relation of absolute scores to age from one test to another, which depends upon the composition of the test. Another way of stating the same thing is to say that the correlation of the scores on a test with chronological age will differ from one test to another. The magnitude of the IQ is directly affected by the amount of this correlation with a result that IQ's for two different tests cannot be assumed to be comparable unless we know that the correlation of the scores for the two tests with chronological age is the same.

Methods of interpretation recommended. Scores on the Terman-McNemar Test may be interpreted in any one of four different ways. These are:

1. Normalized standard scores
2. Mental ages
3. Deviation IQ's (ratio IQ's can be computed, but are not recommended)
4. Percentile ranks corresponding to IQ's.

One or more of these methods of interpreting raw scores will need to be used, depending upon the purpose of giving the test. After we have discussed in detail how these values are to be derived, some attention will be given to the various uses to which each one may be put.

Normalized standard scores. Standard scores are derived directly from the "number right" at the

Table 1

Standard Score Equivalents of Raw Scores on the Terman-McNemar Test of Mental Ability: Forms C and D

Raw Score	Stan. Score	Raw Score	Stan. Score	Raw Score	Stan. Score	Raw Score	Stan. Score
0	30	40	77	80	103	120	124
1	31	41	77	81	103	121	125
2	33	42	78	82	104	122	125
3	34	43	79	83	104	123	126
4	35	44	80	84	105	124	127
5	37	45	81	85	105	125	127
6	38	46	82	86	106	126	128
7	39	47	82	87	107	127	128
8	40	48	83	88	107	128	129
9	42	49	84	89	108	129	130
10	43	50	85	90	108	130	130
11	44	51	86	91	109	131	131
12	45	52	87	92	109	132	132
13	47	53	87	93	110	133	133
14	48	54	88	94	110	134	133
15	49	55	89	95	111	135	134
16	50	56	89	96	111	136	135
17	51	57	90	97	112	137	135
18	53	58	90	98	112	138	136
19	54	59	91	99	113	139	137
20	55	60	91	100	113	140	138
21	56	61	92	101	114	141	139
22	57	62	92	102	114	142	140
23	58	63	93	103	115	143	141
24	60	64	94	104	115	144	142
25	61	65	94	105	116	145	143
26	62	66	95	106	116	146	145
27	63	67	96	107	117	147	146
28	64	68	96	108	117	148	147
29	65	69	97	109	118	149	148
30	66	70	97	110	119	150	149
31	67	71	98	111	119	151	151
32	69	72	98	112	120	152	152
33	70	73	99	113	120	153	153
34	71	74	99	114	121	154	155
35	72	75	100	115	121	155	156
36	73	76	100	116	122	156	158
37	74	77	101	117	122	157	159
38	75	78	102	118	123	158	161
39	76	79	102	119	124	159	163

time the scores are entered on the Class Record. This is done by means of the table which appears in the right-hand margin of the Class Record. The same values also appear in Table 1 of the Manual. Number right should always be translated into standard score as there is no purpose served by raw scores which cannot be better served by standard scores.

Mental ages. Table 2 gives the age for which each of the given standard scores is the norm or average.

TABLE 2 (*Revised*)[1]

NORMS FOR TERMAN-MCNEMAR TEST OF MENTAL ABILITY

Months	Years 10	11	12	13	14	15	16	17	18	19
0	72	79	86	93	100	105	109	113	117	120
1	73	80	87	94	101	105	110	114	117	120
2	73	80	87	94	101	106	110	114	117	120
3	74	81	88	95	102	106	110	114	118	121
4	74	81	88	95	102	107	111	115	118	121
5	75	82	89	96	102	107	111	115	118	121
6	76	83	90	97	103	107	111	115	118	121
7	76	83	90	97	103	108	112	116	119	122
8	77	84	91	98	104	108	112	116	119	122
9	77	84	91	98	104	108	112	116	119	122
10	78	85	92	99	104	109	113	116	119	122
11	78	85	92	99	105	109	113	117	120	123

[1] See page 12 for more information.

These ages are mental ages in the sense in which this term is ordinarily defined. Through the major part of the age range for which the test applies, namely ages 13–16 inclusive, the age equivalents are based entirely upon data obtained in the national standardization program. Above and below these ages the norm line has been corrected to allow for known selection; the corrected values represent the best possible estimate of the true average score which would be obtained by unselected groups of individuals at the given ages. Not every standard score has an age equivalent, as this would involve extrapolating the norm line beyond limits for which adequate data are available. Age values have been given for all ages for which the test applies; higher and lower age values are not given since they would have no possible usefulness except for the computation of ratio IQ's, which are not recommended.

Deviation IQ's. Basically, the procedure for computing deviation IQ's requires that the difference be found between the obtained standard score and the average standard score for other individuals of the same age. This difference or deviation is then interpreted directly in terms of IQ from Table 3. This can be done because both IQ's and the normalized standard scores are distributed normally. For ages 13, 14, and 15, the relation between IQ and standard score is on a 1-to-1 basis. In other words, the IQ for any individual falling between 13–0 and 15–11 may be found by adding or subtracting his deviation-of-score-from-the-norm to or from 100.

TABLE 3

DEVIATION IQ'S CORRESPONDING TO GIVEN DEVIATIONS OF STANDARD SCORE FROM THE NORM

Deviation	Deviation IQ's for Ages 10, 11, 12	13, 14, 15	16 and above
50	161	150	144
49	160	149	144
48	159	148	143
47	158	147	142
46	157	146	141
45	155	145	140
44	154	144	139
43	153	143	138
42	152	142	137
41	150	141	136
40	149	140	136
39	148	139	135
38	147	138	134
37	145	137	133
36	144	136	132
35	143	135	131
34	142	134	130
33	141	133	129
32	139	132	128
31	138	131	128
30	137	130	127
29	136	129	126
28	134	128	125
27	133	127	124
26	132	126	123
25	131	125	122
24	129	124	121
23	128	123	120
22	127	122	120
21	126	121	119
20	125	120	118
19	123	119	117
18	122	118	116
17	121	117	115
16	120	116	114
15	118	115	113
14	117	114	112
13	116	113	112
12	115	112	111
11	113	111	110
10	112	110	109
9	111	109	108
8	110	108	107
7	109	107	106
6	107	106	105
5	106	105	104
4	105	104	104
3	104	103	103
2	102	102	102
1	101	101	101
0	100	100	100
− 1	99	99	99
− 2	97	98	98
− 3	96	97	97
− 4	96	96	96
− 5	94	95	96
− 6	93	94	95
− 7	91	93	94
− 8	90	92	93
− 9	89	91	92
− 10	88	90	91
− 11	86	89	90
− 12	85	88	89
− 13	84	87	88
− 14	83	86	87
− 15	82	85	87
− 16	80	84	86
− 17	79	83	85
− 18	78	82	84
− 19	77	81	83
− 20	75	80	82
− 21	74	79	81
− 22	73	78	80
− 23	72	77	79
− 24	70	76	79
− 25	69	75	78
− 26	68	74	77
− 27	67	73	76
− 28	66	72	75
− 29	64	71	74
− 30	63	70	73
− 31	62	69	72
− 32	61	68	71
− 33	59	67	71
− 34	58	66	70
− 35	57	65	69
− 36	56	64	68
− 37	54	63	67
− 38	53	62	66
− 39	52	61	65
− 40	51	60	64
− 41	50	59	63
− 42	48	58	63
− 43	47	57	62
− 44	46	56	61
− 45	45	55	60
− 46		54	59
− 47		53	58
− 48		52	57
− 49		51	56
− 50		50	55

TABLE 4

PERCENTILE RANK CORRESPONDING TO IQ

IQ	%-ILE
150	99.9
149	99.8
148	99.8
147	99.8
146	99.7
145	99.7
144	99.6
143	99.6
142	99.5
141	99.4
140	99.3
139	99.2
138	99
137	99
136	99
135	98
134	98
133	98
132	98
131	97
130	97
129	96
128	96
127	95
126	94
125	93
124	93
123	92
122	91
121	90
120	89
119	88
118	87
117	85
116	84
115	82
114	81
113	79
112	77
111	75
110	73
109	71
108	69
107	67
106	65
105	62
104	60
103	58
102	55
101	53
100	50
99	48
98	46
97	43
96	41
95	38
94	36
93	34
92	31
91	29
90	27
89	25
88	23
87	21
86	20
85	18
84	16
83	15
82	13
81	12
80	11
79	10
78	9
77	8
76	7
75	6
74	6
73	5
72	4
71	4
70	3
69	3
68	2
67	2
66	2
65	2
64	1
63	1
62	.9
61	.8
60	.7
59	.5
58	.5
57	.4
56	.3
55	.3
54	.2
53	.2
52	.2
51	.1

A method has been provided by means of carefully spaced tables, whereby the IQ may be obtained

for any individual, regardless of age, without any arithmetical computation. The steps involved in this procedure are as follows:

1. In filling out the Class Record, arrange individuals in order of chronological age.
2. In the table on the edge of the Key, find the norm for each individual in turn, by first finding his age and then noting the score value (norm) which appears adjacent to it.
3. Place the scale so that this score or norm is opposite 100 in the proper column of IQ's for the individual's age. For example, the IQ for a child who is 10 years and 9 months old will be found from the first column headed "10, 11, 12."
4. Find the individual's obtained score in the scale appearing on the margin of the Key. Opposite this score in the table you will find the corresponding IQ which can then be entered on the Class Record.

Comparison of ratio and deviation IQ's. The advantages of the deviation method for obtaining a measure of brightness have already been pointed out, but perhaps a word would be helpful as to the relation between IQ's computed by the two methods. For approximately 700 students in the Portsmouth group taking Form C of the new test, both ratio and deviation IQ's have been computed. The results of this comparison are shown below:

$$r_{DIQ \cdot RIQ} = .924$$
$$\eta_{DIQ \cdot RIQ} = .938$$
$$\eta_{RIQ \cdot DIQ} = .934$$
$$\sigma_{DIQ} = 17.1$$
$$\sigma_{RIQ} = 29.1$$

From these data it will be seen that the rank order of deviation and ratio IQ's is very nearly identical, but that the magnitude of the IQ's will vary in increasing amount as one moves away from the mean. Because of the close correspondence between the measures of brightness obtained by the two methods, the authors feel justified in retaining the term "IQ" for the deviation measure although it is not in truth a quotient. The reason for doing this is the widespread use of the term IQ to denote a measure of brightness rather than as an abbreviation for "intelligence quotient." Because of the greater ease of computing deviation IQ's, they are more likely to be accurate than ratio IQ's.

Percentile ranks. Percentile ranks will be infrequently used, but for the benefit of those who do have occasion to use these values, they are also given in Table 4. To find the percentile rank, it is only necessary to find the IQ and opposite it will appear the corresponding percentile rank. If it is desired to find the percentile rank corresponding to a given score without recording the IQ, this can be done by following the procedure for computing IQ's, but, without first recording the IQ's, entering the table of percentile ranks corresponding to IQ's directly. The resulting percentile rank can then be thought of as the percentile rank in terms of scores for individuals of the same age.

IX. Utilizing Terman-McNemar Test Results

Terman-McNemar test results may be used in a wide variety of ways, only a limited number of which can be described here. Since four different methods of interpreting scores have been outlined, the best procedure may be to describe the use of the test according to the method of interpretation.

Normalized standard scores. For practically all purposes the deviation IQ's are superior to standard scores. By the use of deviation IQ's the chronological age factor is partialed out in effect, making the standard deviation constant. However, if scores are to be used, the standard scores are preferable to raw scores.

Mental ages. The uses for which mental ages can be validly employed are very limited. It occasionally is of value to know that an individual's performance is at a level corresponding to the average of children older or younger than himself. For example, in deciding to promote or retard an individual, such information may be helpful. The computation of deviation IQ's, as outlined above, does not require the use of the mental age, as such, but simply requires that the norm be found corresponding to the age of the individual. Ratio method IQ's may be computed using the table of norms as a table of mental ages, but such a procedure is not recommended.

Comparison of ratio IQ's on the old and new forms of the test. IQ's on the old and new forms of the Terman test are not directly comparable because the new norms differ from the old. This results in an increase in the standard deviation of ratio IQ's on the new test. For example, in the Portsmouth population used for equating the old and new forms, the standard deviation of ratio IQ's on the old test for that half of the group taking Form A first was 12.9 points. The standard deviation of deviation IQ's for that part of the group taking the new test, Form C, first was 16.0 points. Thus IQ's on the old and new tests are not directly comparable, and the new IQ's will tend to run higher and lower than those obtained on the old test.

For the benefit of those who have used the old test, a table of corresponding scores has been provided (Table 5) to simplify the transition from the

TABLE 5

STANDARD SCORES ON TERMAN-MCNEMAR TEST OF MENTAL ABILITY CORRESPONDING TO RAW SCORES ON THE ORIGINAL TERMAN GROUP TEST OF MENTAL ABILITY AS ESTABLISHED BY EQUATING FORMS A AND C[1]

Form AorB Raw Score	Form CorD Stan. Score	Form AorB Raw Score	Form CorD Stan. Score	Form AorB Raw Score	Form CorD Stan. Score	Form AorB Raw Score	Form CorD Stan. Score	Form AorB Raw Score	Form CorD Stan. Score
0	19	40	62	80	92	120	111	160	130
1	20	41	63	81	92	121	111	161	131
2	21	42	64	82	93	122	112	162	131
3	23	43	65	83	93	123	112	163	132
4	24	44	66	84	94	124	112	164	132
5	25	45	67	85	94	125	113	165	133
6	26	46	68	86	95	126	113	166	133
7	27	47	69	87	95	127	114	167	134
8	29	48	70	88	96	128	114	168	135
9	30	49	71	89	96	129	115	169	135
10	31	50	72	90	97	130	115	170	136
11	32	51	73	91	97	131	115	171	137
12	33	52	74	92	98	132	116	172	138
13	34	53	75	93	98	133	116	173	139
14	35	54	75	94	99	134	117	174	140
15	37	55	76	95	99	135	117	175	141
16	38	56	77	96	100	136	118	176	141
17	39	57	78	97	100	137	118	177	142
18	40	58	78	98	101	138	119	178	143
19	41	59	79	99	101	139	119	179	144
20	42	60	80	100	102	140	120	180	145
21	43	61	81	101	102	141	120	181	146
22	44	62	81	102	103	142	121	182	147
23	45	63	82	103	103	143	121	183	149
24	46	64	83	104	103	144	122	184	150
25	47	65	83	105	104	145	122	185	151
26	48	66	84	106	104	146	122	186	152
27	49	67	85	107	105	147	123	187	153
28	50	68	85	108	105	148	124	188	154
29	51	69	86	109	106	149	124	189	156
30	52	70	87	110	106	150	125	190	157
31	53	71	87	111	107	151	125	191	158
32	54	72	88	112	107	152	126	192	159
33	55	73	88	113	108	153	126	193	161
34	56	74	89	114	108	154	127	194	162
35	57	75	89	115	109	155	127	195	163
36	58	76	90	116	109	156	128	196	165
37	59	77	90	117	109	157	128	197	166
38	60	78	91	118	110	158	129	198	167
39	61	79	91	119	110	159	129		

old test to the new. By means of this table a standard score on the new test corresponding to any given raw score on the old test may be found, and from this estimated standard score and the individual's chronological age, his deviation IQ according to the new norms may be determined.

[1] Since the original Forms A and B were matched for item difficulty in their construction, their comparability later checked experimentally, and since the two forms have been used interchangeably with apparent success for many years, it should be safe to assume that the standard score values in this table can be used for Form B as well as Form A of the original test. The equating of Forms C and D of the new test has already been discussed in the section on *Comparability of old and new forms.*

Deviation IQ's. Whenever a measure of brightness, as contrasted with a measure of mental level is needed, the deviation IQ serves this purpose. It assumes that brightness is normally distributed in any large, unselected population and that once a measure of brightness is determined for the individual it will remain constant provided the environment in which the individual moves also has a constant effect upon him. The uses to which IQ's may be put are many. If tests are given systematically over a range of grades, it is possible to determine fluctuations in the potentiality of an individual from one age to another. For example, such systematic determination of IQ's at successive ages will often provide a clue to causes of lowered average level of performance for an individual in comparison with average levels in previous years. The IQ may be used in sectioning classes, especially if promotion is on the basis of chronological age. It is of great value in guidance as it makes it possible to steer away from the professions and higher-level jobs those who do not have the mental capacity for them. Conversely it helps locate capable individuals who need encouragement and help in getting additional training.

Percentile rank. Only rarely will it be found necessary to resort to the use of percentile ranks in interpreting the Terman-McNemar results. Almost the only situation where this is desirable is where an attempt is to be made to compare achievement on a test for which percentile norms are supplied with the intelligence test results. Such a comparison is valid provided the group on which the achievement measure was standardized comprises a representative cross section of the total group at the given age or grade level. This will not be the case for most high school subject matter tests as there is a decided selection in the groups studying certain subjects. For example, percentile ranks on an algebra test should not be compared with percentile ranks on the Terman-McNemar test since there is a great deal of selection in the group taking algebra; the average IQ of this group is definitely above 100.

Subtest scores. No provision has been made for interpreting separate subtest scores, partly because the tests are too short, and partly because the tests comprising the battery are all essentially verbal in nature; having subtest scores, under the circumstances, would add little to our knowledge of the individuals tested.

Cumulative record. No better example can be found of the old saying that the whole is greater than the sum of the parts than the cumulative record on which the test scores for an individual are entered

and cumulated over a period of years. Such a record can reveal more about the nature of that individual and his growth processes than any single test can possibly hope to do. It is strongly urged, therefore, that the results of the Terman-McNemar test be entered on the cumulative record card. If possible, enter both standard score and IQ, and if mental ages must be entered on the record, enter standard score and IQ as well as mental age, for convenience in later reference.

Revised norms. Originally the Terman-McNemar Test of Mental Ability was planned to cover the same grade range as the older Terman test — namely, Grades 7–12 — and therefore no attempt was made in the national standardization program to obtain data below the end of Grade 6. However, the results obtained in the standardization program indicated that the Terman-McNemar test could be used satisfactorily in the sixth grade. In light of this development a subsidiary experiment was undertaken for the purpose of extending the norms downward and, at the same time, to establish any correction necessary if the test were used with a Separate Answer Sheet in these lower grades. The results of this latest experiment are summarized in Table 2 (*Revised*) on page 9, and in the Separate Answer Sheet norms in Table 6, below.

The norms for the regular edition of the test have not been changed above age 14–0; that is, they remain as they appeared in the original Manual. At age 13–0 there is a difference of two points: the norm for that age is now 93; originally it was 95. The difference is greater in the lower age brackets. The variation from the original norms when the Separate Answer Sheet is used is substantial, especially in the lower ages.

TABLE 6

Use this table when Separate Answer Sheet is used.

NORMS FOR TERMAN-McNEMAR TEST OF MENTAL ABILITY

Months	*Years* 10	11	12	13	14	15	16	17	18	19
0	67	75	83	91	98	104	109	113	117	120
1	68	76	84	92	98	104	110	114	117	120
2	68	77	85	92	99	105	110	114	117	120
3	69	77	85	93	100	105	110	114	118	121
4	70	78	86	93	100	106	111	115	118	121
5	70	79	87	94	101	106	111	115	118	121
6	71	79	87	94	101	107	111	115	118	121
7	72	80	88	95	102	107	112	116	119	122
8	72	81	88	96	102	107	112	116	119	122
9	73	81	89	96	103	108	112	116	119	122
10	74	82	90	97	103	108	113	116	119	122
11	75	83	90	97	103	109	113	117	120	123

Norms for Separate Answer Sheet. The norms in Tables 6 and 7 are to be used only when the Separate Answer Sheet has been used.

Table 6 corresponds to Table 2 (*Revised*) of the regular edition and gives the age for which each of the given standard scores is the norm or average. These ages are mental ages in the sense in which this term is ordinarily defined. (For additional information see the section on "Mental ages," page 9.)

Table 7 corresponds to the table found on the right edge of the hand-scoring key. Its use facilitates the finding of the IQ without arithmetical computation. *It is only for the Separate Answer Sheet.* The steps involved are as follows:

1. For convenience, arrange the pupils' papers in order of chronological age.
2. For each individual in turn, find in the "Age" column of Table 7 his chronological age and then note the standard score value (norm) which appears adjacent to it.
3. Place the table (or scale) so that this score or norm is opposite 100 in the proper column of IQ's for the individual's chronological age in Table 3, page 9. For example, the IQ for a child who is 13 years and 9 months old will be found from the second column, which is headed "13, 14, 15."
4. Locate the individual's obtained standard score in the scale, and to the right of this score you will find in Table 3, under the appropriate age, the pupil's IQ.

The deviation IQ is based on the amount of deviation (plus or minus) between the pupil's obtained standard score and the norm for his age. (For additional information on this point see pages 9–10.)

TABLE 7

Age for Which Given Score Is the Norm	Score
	160
	159
	158
	157
	156
	155
	154
	153
	152
	151
	150
	149
	148
	147
	146
	145
	144
	143
	142
	141
	140
	139
	138
	137
	136
	135
	134
	133
	132
	131
	130
	129
	128
	127
	126
	125
	124
19–11, **20–0**	123
19–7 to 19–10	122
19–3 to 19–6	121
18–11 to **19–2**	120
18–7 to 18–10	119
18–3 to 18–6	118
17–11 to **18–2**	117
17–7 to 17–10	116
17–4 to 17–6	115
17–1 to 17–3	114
16–10 to **17–0**	113
16–7 to 16–9	112
16–4 to 16–6	111
16–1 to 16–3	110
15–11 to **16–0**	109
15–9 to 15–10	108
15–6 to 15–8	107
15–4 to 15–5	106
15–2 to 15–3	105
15–0 to **15–1**	104
14–9 to 14–11	103
14–7 to 14–8	102
14–5 to 14–6	101
14–3 to 14–4	100
14–2	99
14–0 to **14–1**	98
13–10 to 13–11	97
13–8 to 13–9	96
13–7	95
13–5 to 13–6	94
13–3 to 13–4	93
13–1 to 13–2	92
13–0	91
12–10 to 12–11	90
12–9	89
12–7 to 12–8	88
12–5 to 12–6	87
12–4	86
12–2 to 12–3	85
12–1	84
11–11 to **12–0**	83
11–10	82
11–8 to 11–9	81
11–7	80
11–5 to 11–6	79
11–4	78
11–2 to 11–3	77
11–1	76
10–11 to **11–0**	75
10–10	74
10–9	73
10–7 to 10–8	72
10–6	71
10–4 to 10–5	70
10–3	69
10–1 to 10–2	68
10–0	67
	66
	65
	64
	63
	62
	61
	60
	59
	58
	57
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	53
	52
	51
	50

STANFORD ACHIEVEMENT TEST

By Truman L. Kelley, Giles M. Ruch, and Lewis M. Terman

ADVANCED BATTERY—COMPLETE
FORM G

Adv. Compl.
G

Name.....Age.....Grade.....

Boy or girl.....Name of school.....

City.....State.....Date.....

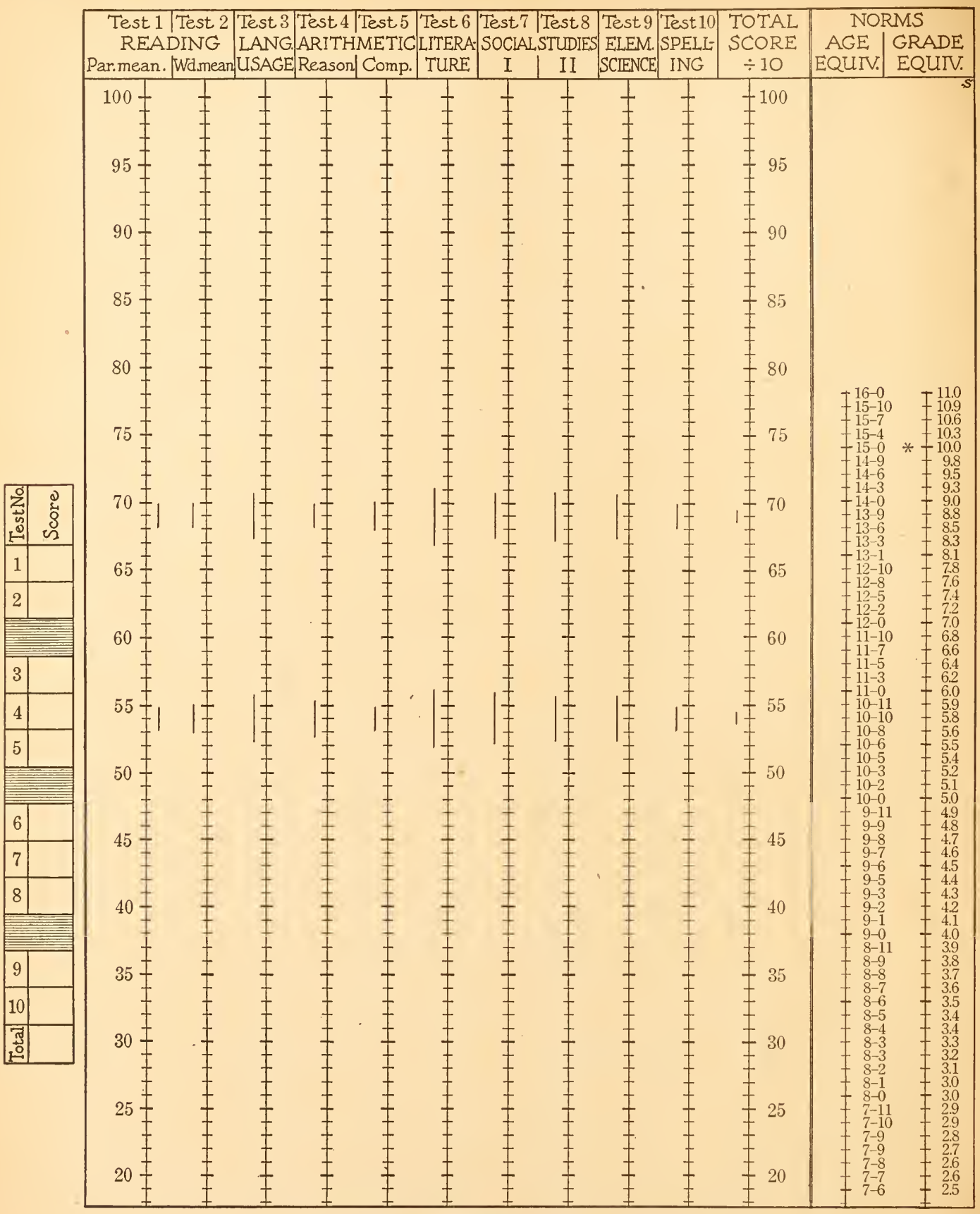
Test	Score	Age Equivalent	Grade Equivalent
1. Paragraph Meaning			
2. Word Meaning			
Average Reading			
3. Language Usage			
4. Arithmetic Reasoning			
5. Arithmetic Computation			
Average Arithmetic			
6. Literature			
7. Social Studies: I			
8. Social Studies: II			
Average Social Studies			
9. Elementary Science			
10. Spelling			
Total (Average)			

Published 1942 by World Book Company, Yonkers-on-Hudson, New York, and Chicago, Illinois
 SAT: ADV. COMPL.: G-5

PRINTED IN U.S.A.

Edition a

PROFILE CHART: STANFORD ACHIEVEMENT TEST, INTERMEDIATE AND ADVANCED BATTERIES — COMPLETE



* Age and grade equivalents above this point are extrapolated values.

☞ *This Profile Chart is a table of norms for the Intermediate and Advanced Examinations.*

Comments:

DIRECTIONS. In the paragraphs below, each number shows where a word has been left out. Read each paragraph carefully, and wherever there is a number decide what word has been left out. Then write the missing word in the answer column at the right, as shown in the sample. Write JUST ONE WORD on each line. *Be sure to write each answer on the line that has the same number as the number of the missing word in the paragraph.*

SAMPLE.

A–B Dick and Tom were playing ball in the field. Dick was throwing the —A— and —B— was trying to catch it.

Answer
A ball
B

1–2 Scientific studies in recent years have tended to lessen the importance of meat in our diet. Most authorities feel, however, that it would be unwise to attempt to live wholly on a vegetarian diet. So-called vegetarians use milk, butter, cream, cheese, and eggs. In this way they get a more balanced —1— and do not suffer from the harmful effects that might possibly result from a strictly —2— diet.

1 _____
2 _____

3 Alliteration is the name given to the near recurrence of the same initial sound in speech or writing. It comes very easily and naturally in the English language and many alliterative lines are found in our poetry. *Pride and Prejudice* is an example of the use of —3— in the title of a book.

3 _____

4–5–6–7–8 In Siam, the natives have a strange sport — fights between trained fish, on the results of which great sums of money and goods are wagered. In staging a fight, two —4— are placed in a large glass jar filled with water. At first they —5— leisurely about in the water. Sooner or later one fish spies the other. Anger causes his dark-green body to turn a brilliant red and brings out purple spots on tail and fins. A fight ensues. The other fish also changes —6— as his anger mounts, and they charge and countercharge for hours. Finally one or the other tires and the fight goes out of him. He turns —7— again, goes to the bottom of the jar, and stays there. The fish that stays red the longer is proclaimed the —8—.

4 _____
5 _____
6 _____
7 _____
8 _____

9–10–11 Patents, copyrights, and trade-marks are devices, respectively, for protecting creations of the mind such as inventions, works of art or literature, and slogans or identifying insignia of a manufacturer. An inventor's first step after making a discovery is to take out a —9— on his invention. A manufacturer registers a —10— to identify his product. A —11— protects a book from unpermitted publication by others.

9 _____
10 _____
11 _____

Go right on to the next page.

12-13-14 In the days when the Caesars ruled Rome, gladiatorial contests were held in the Colosseum. These provided one of the chief sources of entertainment for the emperor and his court. The gladiators were professional swordsmen who fought until one was killed or too severely wounded to continue. Their adversaries were sometimes wild animals instead of other —12—. However, prisoners of war or Christians instead of professional gladiators were usually pitted against the wild and half-starved —13— for the —14— of the Romans.

12 _____
13 _____
14 _____

15-16 We are indebted to Lister for the beginnings of the science of modern surgery. The name of —15— is famous chiefly for his discovery of the use of antiseptics in wound infection. As a result of his work the medical science of —16— has greatly broadened its scope.

15 _____
16 _____

17-18 Grass grows best in a soil that is slightly acid. On the other hand, most vegetables require an alkaline soil. Lime acts as an alkali in the soil, in that it acts chemically with acids to neutralize their effects. A gardener would be more likely to use lime in growing —17— than for —18—.

17 _____
18 _____

19-20 The words *civil* and *polite* are both used to denote acceptable modes of social behavior. However, *polite* is a stronger and more expressive word than *civil*. A —19— person may act and talk so as to give no offense, but a —20— person evidences a real desire to please when the occasion arises.

19 _____
20 _____

21-22-23 Leonardo da Vinci is best known as a painter, but he was also a great scholar and scientist. His genius was expressed not only in —21— but also in engineering, architecture, and mathematics. He anticipated many discoveries of modern —22—, including the airship. The greatest example of his —23— ability is his famous mural, "The Last Supper."

21 _____
22 _____
23 _____

24-25 In the glacial period, prehistoric men had to flee from the oncoming ice and snow. They had to struggle day and night against cold and hunger, and only the cleverest among them were able to survive during this time. They had to learn to make clothing from skins, to use fire, to make tools, and to preserve food. And so the —24— era, which had threatened to destroy the human race, became its greatest teacher, because it forced man to —25— out ways of self-preservation.

24 _____
25 _____

Go right on to the next page.

26-27 The importance of vocational counseling for youth is being recognized more and more, and counselors are available in many schools and other agencies. In the present complex social and industrial system, with its emphasis on specialization in every field of endeavor, it is difficult for youth to choose a vocation. In many cases it is only by the aid of an understanding —26— who analyzes his abilities and aptitudes that he finds the —27— for which he is suited.

26 _____

27 _____

28-29-30-31 A light year is the distance that a ray of light travels in one year's time. The distance involved, and not the fact that there is a ray of light traversing it, constitutes the light year. If an automobile should run that far in the dark, it would have gone a light year. In this case there is no —28— involved and also no —29— considered, but it would nevertheless be properly called a —30— —31—.

28 _____

29 _____

30 _____

31 _____

32-33-34 Individuals have different kinds of imagery, such as visual, auditory, olfactory, etc. Muscle imagery is called kinesthetic imagery. A lovely melody haunts us by —32— imagery, a beautiful picture returns to mind in —33— imagery, and the mighty swing of the pitcher's arm is guided by muscular or —34— imagery of former pitchers.

32 _____

33 _____

34 _____

35-36 "Your old men shall dream dreams, your young men shall see visions," means that the thoughts of youth are directed chiefly toward —35— events, while those of the aged deal mainly with the —36—.

35 _____

36 _____

37-38-39 The saying " Pity the man who grows remorseful when he sees his son imitating him " means that a man's own life has —37— been above reproach when he would not —38— his son to follow his —39—.

37 _____

38 _____

39 _____

40-41 On the average, the population of the United States has been growing older. Two factors have been largely responsible for this shift: the declining birth rate and the increasing average length of life. The change in the birth rate means that —40— children will be born per 1000 population. The increased length of life is reflected in a —41— death rate per 1000 population.

40 _____

41 _____

42-43 The condition known as " cretinism " is due primarily to a deficiency of the secretion of the thyroid gland. The cretin is dwarfed in mind and body. The administration of thyroid extract to supplement the individual's own thyroid —42— sometimes results in marked improvement of the physical and —43— symptoms of the disease.

42 _____

43 _____

44-45 Flu is an abbreviation of influenza and gym of gymnasium. If repetition is abridged in the same manner as gymnasium and detective as influenza, then —44— stands for repetition and —45— for detective.

44 _____

45 _____

End of Test 1. Look over your work.

Number right	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Equated score	40	41	42	44	45	46	47	48	49	50	51	52	53	54	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	77	79	81	83	84	86	87	89	91	92	93	94

DIRECTIONS. In each exercise one of the five numbered words will complete the sentence correctly. Note the number of this word. Then mark the answer space at the right which is numbered the same as the word you have selected.

SAMPLES.

A A **rose** is a — 1 box 2 flower 3 home 4 month 5 river . . . . . A

B A **roof** is found on a — 6 book 7 person 8 rock 9 house 10 word . . . . . B

C **Bread** is something to — 1 catch 2 drink 3 throw 4 wear 5 eat C

1 A **surgeon** — 1 persecutes 2 rebukes 3 diffuses 4 solicits 5 operates 1

2 To be **guilty** is to be — 6 necessary 7 nice 8 proper 9 wrong 10 single 2

3 **Lucky** means — 1 abundant 2 capable 3 careless 4 marvelous 5 fortunate . . 3

4 To **estimate** is to — 6 attend 7 honor 8 guard 9 judge 10 separate 4

5 A **comment** is a — 1 collection 2 cluster 3 hood 4 remark 5 privilege 5

6 To **persuade** is to — 6 contract 7 droop 8 interrupt 9 pause 10 convince . . 6

7 A **conclusion** is a — 1 revolution 2 burial 3 decision 4 circuit 5 rumor 7

8 A **serpent** is a — 6 robber 7 snake 8 shield 9 beggar 10 priest 8

9 **Barbarous** means — 1 regular 2 private 3 tender 4 false 5 fierce 9

6 →

10 **Sprightly** means — 6 guilty 7 original 8 costly 9 lucky 10 active 10

11 To **exist** is to be — 1 bold 2 honest 3 alive 4 useful 5 dangerous 11

12 **Venison** is meat from a — 6 turkey 7 squirrel 8 dove 9 deer 10 fowl 12

13 To **decline** is to — 1 deliver 2 refuse 3 consent 4 declare 5 obtain 13

14 To **toil** is to — 6 fall 7 rest 8 play 9 read 10 work 14

15 **Obligation** means — 1 value 2 square 3 duty 4 object 5 difference 15

16 A **hazard** is a — 6 peril 7 fable 8 rumor 9 memorial 10 ceremony 16

17 **Inverted** means — 1 resumed 2 reversed 3 revived 4 rejected 5 redeemed . . 17

18 **Notable** means — 6 unjust 7 horrible 8 polite 9 remarkable 10 marvelous . . 18

19 To **dispatch** is to — 1 catch 2 count 3 desire 4 doubt 5 send 19

20 A **battalion** is part of a — 6 faculty 7 crib 8 catalog 9 regiment 10 corporation 20

21 **Eternally** means — 1 already 2 squarely 3 rapidly 4 equally 5 always 21

22 A **javelin** is a — 6 weapon 7 chariot 8 mantle 9 veil 10 steamer 22

23 A **frenzy** is a — 1 rage 2 hotel 3 fowl 4 prophet 5 robe 23

Go right on to the next page.

24 **Ruthless** means — 6 amiable 7 fickle 8 hideous 9 boisterous 10 merciless . . 24 6 7 8 9 10

25 A **trowel** is a tool of — 1 barbers 2 masons 3 cobblers 4 mariners 5 preachers 25 1 2 3 4 5

26 **Righteous** means — 6 virtuous 7 clever 8 victorious 9 miserable 10 lucky . . 26 6 7 8 9 10

27 To **isolate** is to — 1 unite 2 prepare 3 complete 4 destroy 5 separate 27 1 2 3 4 5

28 A **vocation** is an — 6 adventure 7 examination 8 occupation 9 absence 10 image 28 6 7 8 9 10

29 An **ally** is an — 1 image 2 ornament 3 ambition 4 associate 5 adventure . . 29 1 2 3 4 5

30 To **aspire** is to have — 6 ambition 7 adventure 8 position 9 appeal 10 triumph . . 30 6 7 8 9 10

31 A **controversy** is a — 1 boundary 2 discovery 3 dispute 4 disguise 5 contract 31 1 2 3 4 5

32 To **molest** is to — 6 awe 7 bother 8 consume 9 fulfill 10 soften 32 6 7 8 9 10

33 **Rational** means — 1 unusual 2 helpless 3 reasonable 4 stupid 5 invisible . . 33 1 2 3 4 5

34 A **haze** is an — 6 omission 7 obscurity 8 utensil 9 apparatus 10 inclination 34 6 7 8 9 10

35 A **serene** person is — 1 sleepy 2 unjust 3 peaceful 4 queer 5 restless 35 1 2 3 4 5

36 To **gild** is to — 6 dive 7 adorn 8 fling 9 adore 10 grin 36 6 7 8 9 10

37 To **lament** is to — 1 gaze 2 excuse 3 punish 4 mourn 5 oblige 37 1 2 3 4 5

7 ➔

38 A **conscientious** worker is — 6 serene 7 nimble 8 diligent 9 impatient 10 confused 38 6 7 8 9 10

39 A **felon** is a — 1 criminal 2 hermit 3 patriot 4 pioneer 5 seaman 39 1 2 3 4 5

40 **Merit** means — 6 cost 7 truth 8 price 9 purpose 10 worth 40 6 7 8 9 10

41 **Tempestuous** means — 1 fatal 2 peaceful 3 stormy 4 prosperous 5 convenient 41 1 2 3 4 5

42 To **stimulate** is to — 6 expose 7 excite 8 reduce 9 stifle 10 withdraw 42 6 7 8 9 10

43 **Opaque** means not — 1 elaborate 2 transparent 3 flexible 4 eloquent 5 effective 43 1 2 3 4 5

44 An **antagonist** is an — 6 usher 7 invalid 8 interpreter 9 urchin 10 opponent 44 6 7 8 9 10

45 An **onerous** task is — 1 oppressive 2 unreal 3 grisly 4 sagacious 5 gusty . . . 45 1 2 3 4 5

46 **Chaos** means — 6 vanity 7 ambition 8 satisfaction 9 confusion 10 consequence 46 6 7 8 9 10

47 To **captivate** means to — 1 fascinate 2 exclude 3 divert 4 gratify 5 eliminate 47 1 2 3 4 5

48 **Supple** means — 6 rigid 7 somber 8 massive 9 flexible 10 obvious 48 6 7 8 9 10

49 To **contrive** is to — 1 interrupt 2 instruct 3 invent 4 persuade 5 pause 49 1 2 3 4 5

50 An **inflection** is an — 6 amendment 7 outlet 8 angle 9 impression 10 item . . 50 6 7 8 9 10

End of Test 2. Look over your work.

Number right	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Equated score	45	46	47	48	49	50	51	52	53	53	54	55	56	57	58	58	59	60	61	62	62	63	64	65	66	67	67	68	69	70	71	72	73	74	75	76	77	79	80	81	82	83	84	85	86	87	88	89	90	91	92

DIRECTIONS. Study the samples below carefully.

SAMPLES.

A Apples 1 is / 2 are good. . . . . A

B He 3 told / 4 telled me. . . . . B

1 They 1 are / 2 have been here two months already. . . 1

2 He must have felt 3 stupid. / 4 stupidly. 2

3 Have you 5 spoke / 6 spoken to mother? 3

4 The clerk gave 1 us / 2 we boys some candy. 4

5 He acted the part 3 perfect. / 4 perfectly. 5

6 The tent has 5 blown / 6 blew down. 6

7 There 1 are / 2 aren't hardly any left. 7

8 I ate 3 the biggest apple I almost / 4 almost the biggest apple I ever saw. 8

9 5 She / 6 Her and I will set the table. 9

10 The flower is 1 sort of / 2 rather wilted. 10

8a →

11 Mary knits 3 rapid. / 4 rapidly. 11

12 John will give it to 5 whoever / 6 whomever wants it. . . . 12

13 A dollar is 1 most / 2 almost all I got for it. 13

14 I believe in 3 observance / 4 observation of the Sabbath. . . . 14

15 Mary and I 5 wasn't / 6 weren't to blame. 15

16 I had 1 sat / 2 set there but a moment. 16

17 His skin has 3 broken / 4 broke out in spots. 17

18 The girl 5 which / 6 whom you saw is Grace. 18

19 Great rocks 1 raise / 2 rise out of the water. 19

20 She speaks French very 3 bad. / 4 badly. 20

21 5 But don't forget, / 6 Don't forget, however, to hurry. 21

22 A cross dog 1 attacked / 2 attackted us. 22

23 It was 3 he / 4 him who sent the note. 23

24 The wheel 5 broke just / 6 just broke as we started. 24

Go right on to Number 25.

25 1 Who's / 2 Whose hat is that? 25

26 George and Ralph 3 is / 4 are invited. 26

27 It was the 5 most powerful / 6 powerfulest locomotive. 27

28 She is neither happy 1 nor / 2 or sad. 28

29 He must have hidden it 3 someplace. / 4 somewhere. 29

30 I read 5 that / 6 where Congress adjourned. 30

31 The flowers look 1 some / 2 somewhat better now. . . 31

32 I will 3 bring / 4 take the car over there tomorrow. 32

33 A rag and a china doll 5 are / 6 is lost. 33

34 She 1 ought not / 2 hadn't ought to stop now. 34

35 3 Us / 4 We boys are the ones who did it. 35

36 Hearing thunder, 5 their tent was put up. / 6 they put up the tent. 36

37 I wanted to 1 lay / 2 lie down and sleep. 37

38 They have 3 come / 4 came by automobile. 38

8b →

39 I didn't see 5 as / 6 that the blue ones would fit. 39

40 The 1 principal / 2 principle is in his office. 40

41 She had just 3 risen / 4 rose from her chair. 41

42 I am 5 real / 6 really serious about this. 42

43 A crowd of 1 we / 2 us boys went camping. 43

44 Get a written contract, not 3 an oral / 4 a verbal one. 44

45 I like May better than 5 any / 6 any other month. 45

46 I 1 have / 2 haven't but a few left. 46

47 To whom did you 3 give it? / 4 give it to? 47

48 They came 5 without / 6 with hardly any clothes. . . 48

49 He has 1 ridden / 2 rode a bucking horse. 49

50 Our guests and 3 us / 4 we played games. 50

51 I forbid it; you 5 will / 6 shall not go! 51

52 Father and mother 1 expect / 2 expects company. 52

Go right on to the next page.

Difference	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Equated score	48	48	49	50	50	51	51	52	52	53	53	54	54	55	56	56	57	57	58	58	59	60	60	61	61	62	62	63	63	64	64	65	65	66	66	67	68	68	69	70	71	71	72	72	73	73	74	74	75	76	77

53 She is as tall as 3 I. 4 me. 53 3 4

54 Jim and Joe were 5 both equally anxious. 6 equally anxious. 54 5 6

55 Mary 1 will 2 shall be able to sleep well here. . . . 55 1 2

56 They 3 surely 4 sure do like skating. 56 3 4

57 5 After notifying me, 6 After I had been notified, I accepted. 57 5 6

58 I can't see 1 whom 2 who it is. 58 1 2

59 The quartet has 3 sang 4 sung twice. 59 3 4

60 There 5 go 6 goes my papers. 60 5 6

61 We 1 lay 2 laid the injured dog on a blanket. . . . 61 1 2

62 He gave flowers to everyone except 3 her. 4 she. 62 3 4

63 His strength was like a 5 lion. 6 lion's. 63 5 6

64 Father has 1 lain 2 laid down to rest. 64 1 2

65 One of those girls 3 do 4 does very good work. . 65 3 4

66 I do not approve of 5 Helen 6 Helen's going. 66 5 6

9*a*➜

67 The men came 1 near 2 nearly finishing today. . . . 67 1 2

68 3 Who 4 Whom are you inviting? 68 3 4

69 She 5 seldom ever 6 hardly ever makes a mistake. 69 5 6

70 A beggar has just 1 rang 2 rung the bell. 70 1 2

71 3 Who 4 Whom do you think has worked best? . . . 71 3 4

72 Every man and boy received 5 his 6 their pay. . . 72 5 6

73 He has 1 less 2 fewer books than Ted. 73 1 2

74 The plane with both pilots 3 were 4 was lost. . . . 74 3 4

75 Either tan or gray 5 look 6 looks well on me. 75 5 6

76 This is the 1 worse 2 worst of the two. 76 1 2

77 This collection of insects 3 is 4 are valuable. . . . 77 3 4

Go right on to Number 78.

78 Two boys have 5 run 6 ran a tie race. 78 5 6

79 Our team has made 1 their 2 its first score. . . . 79 1 2

80 This is a secret between you and 3 me. 4 I. . . 80 3 4

81 Is your lesson different 5 from 6 than mine? 81 5 6

82 He had one of the best dogs there 1 was. 2 were. 82 1 2

83 This is the 3 brightest 4 brighter of the two stars. . . . 83 3 4

84 5 This 6 These sort of pies is good. 84 5 6

85 Was that 1 he? 2 him? 85 1 2

86 I, not my sisters, 3 am 4 are invited. 86 3 4

87 Was it 5 her? 6 she? 87 5 6

88 Have you 1 drank 2 drunk your milk? 88 1 2

89 Everybody should take 3 his 4 their seat. 89 3 4

90 He wonders if it was 5 her. 6 she. 90 5 6

91 Mother sent Elizabeth and 1 I. 2 me. 91 1 2

9*b*➜

92 They told 3 her and me 4 she and I to go. 92 3 4

93 How do you know it was 5 they? 6 them? 93 5 6

94 I like 1 that 2 those kind of nuts. 94 1 2

95 Here 3 is 4 are my hat and umbrella. 95 3 4

96 He is one of the boys who 5 tries. 6 try. 96 5 6

97 A load of pigs 1 are 2 is to be sold. 97 1 2

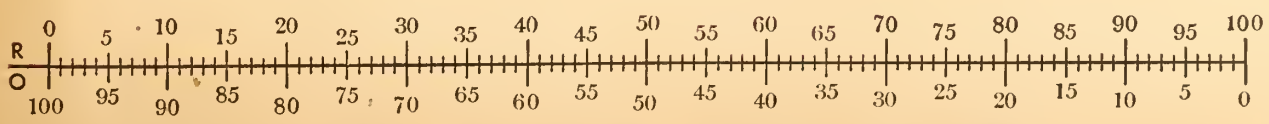
98 Every one of the pupils 3 is 4 are present. . . . 98 3 4

99 Either of the games 5 are 6 is enjoyable. 99 5 6

100 1 Is 2 Are either of you ready yet? 100 1 2

End of Test 3. Look over your work.

No. right (   ) × 2 (   )
No. omitted (   )
Sum (   )
Subtract 100
Difference (   )



51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
77	78	78	79	79	80	81	82	82	83	83	84	84	85	85	86	86	87	87	88	88	89	90	90	91

76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
91	92	92	93	94	94	95	95	96	96	97	97	98	98	99	99	100	101	101	102	103	104	104	105	105

DIRECTIONS. Find the answers to these problems as quickly as you can. Write the answers on the dotted lines. Use the margins to figure on.

Answer

1 Nine months are what fraction of a year, in simplest form? ------

2 Ann bought $2\frac{1}{3}$ yd. of ribbon at 30¢ per yd. How much did the ribbon cost her? ------

3 In one year the 427 pupils in Central School took out 5124 library books. This was an average of how many books per pupil? ------

4 Seven sales were made in the Gift Shop the first half hour. At that rate, how many sales would be made in $3\frac{1}{2}$ hours? ------

5 A wading pool is $2' \times 20' \times 60'$. What is its capacity in cubic feet? ------

6 A property worth $20,000 is assessed at 40% of its value. What is its assessed valuation? ------

7 A barrel holds 30 gallons. How many bucketfuls, each of $2\frac{1}{2}$ gallons, will be needed to fill this barrel? ------

8 A scale drawing reads $1'' = 12''$. A line $3\frac{1}{4}$ inches long on this drawing represents ___?___ inches. ------

9 The rainfall in our city each year for the past 6 years in inches was: 31, 35, 42, 38, 34, and 36. The average rainfall for these 6 years was how many inches? ------

10 The diameter of a circle is 70 yards. The circumference is ___?___ yards. (Use $3\frac{1}{7}$ for π.) ------

11 The expenses of a family on a 6-day vacation were: food for 5 persons, $3.25 per day; cabin for 6 days, $9.00; and other expenses, 75¢ per day. What was the total cost? ------

12 Joe read that 400 persons, or $\frac{1}{7}$ of the population of his town, were out of work. What is the population of his town? ------

Go right on to Problem 13.

Answer

13 Mary's arithmetic book has 800 problems. She solved 600 of the problems correctly. What per cent of the problems did she solve correctly? ------

14 A table sells for $80. The cost is .625 of the selling price. What is the cost? ------

15 A trapezoid has bases of 45″ and 55″. The height is 20″. The area is ___?___ sq. in. (Use the formula $A = \frac{b + b'}{2} \times h$.) ------

16 A house is assessed at $6000. The tax rate is $2.50 per $100. How much is the tax? ------

17 It took Joe from 7:50 A.M. to 2:30 P.M. to build a dog house. How many hours did it take him? ------

18 A rectangular lot is $30' \times 60'$. It is all in lawn except a rectangular pool $5' \times 10'$. How many square feet are in lawn? ------

19 The perimeter of a square is 640 miles. What is the length of a side in miles? ------

20 Eight feet of a 32-foot pole are underground. Compare the underground portion with the total length of the pole as a decimal fraction. ------

21 If Mr. Weeks buys a $7500 life insurance policy, the annual premium will be $20 per $1000. How much premium must he pay annually? ------

22 How much must one invest at 5% in order to earn $75 interest a year? ------

23 An overcoat sold at a sale for $20. The coat cost the merchant $16 and his overhead was $7. The per cent of loss was ___?___%, if figured on the selling price. ------

24 If +7 represents a gain of 7 yards on one play and −4 is the loss of 4 yards on the next play, what number represents the net gain on the two plays? ------

Go right on to the next page.

Answer

25 A store is to be built on a lot 40 feet wide. How many feet long must the store be made in order that there will be 3600 sq. ft. of floor space? ------

26 Joe has s stamps. He sold 10 of them to Harry. How many stamps did he have left? ------

27 A rectangular swimming pool is 90 ft. long and 30 ft. wide. What is its area in *square yards?* ------

28 A loan of $500 at 5% interest was paid at the end of two years. What was the total of the simple interest and principal then? ------

29 The ratio of the width of a farm to its length is 6 to 15. Express this ratio as a decimal. ------

30 Angle M of triangle MNO equals 30° and angle N equals 90°. How many degrees does angle O equal? ------

31 At the time that a man 6 ft. tall casts a shadow 4 ft. long, a tree casts a shadow 40 ft. long. How tall is the tree? ------

32 A motorist used 18 gallons of gas in driving 312.9 miles. *To the nearest one tenth of a gallon,* what was his mileage per gallon? ------

Go right on to Problem 33.

Answer

33 An explorer traveled 480 miles, or .48, of his total trip, using a dog team. What was his total trip in miles? ------

34 Mr. Ross paid $850 for a bond of $1000 face value, bearing 2% interest. How much should his annual interest be? ------

35 A factory valued at $5000 was insured against fire for 80% of its value. The rate was $.40 per $100. How much was the amount of the premium? ------

36 How many degrees of a circle graph would you shade to show that 75% of the days during July were without rain? ------

37 An invoice for a $500 bill of goods was marked "2%, 10 days; 60 days, net." What should have been the amount of a check sent in payment by return mail? ------

38 Triangles LMN and $L'M'N'$ are similar. Side LM is 15′, side MN is 12′, and side $L'M'$ is 30′. How long is side $M'N'$? ------

39 The floor area of a square factory building was stated as 6400 sq. ft. What is the length in feet of one side of the floor? ------

40 What does $1000 amount to in 1 year at 6% interest, compounded semiannually? ------

End of Test 4. Look over your work.

Number right	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Equated score	51	52	54	55	57	58	59	60	62	63	64	66	68	70	71	73	74	75	76	78	79	80	82	83	84	85	86	87	88	89	90	91	93	94	95	96	97	98	99	100	101

DIRECTIONS. Get the answers to these examples as quickly as you can without making mistakes. Look carefully at each example to see what you are to do.

As soon as you have finished an example, write the answer on the line provided at the right.

Be sure to put your answer on the line that has the same number as the number of the example.

1 Multiply
218
700

2 56)2968

3 Add
785624
572490
833946

4 Subtract
4
$3\frac{1}{4}$

5 Subtract
633314
438197

6 Add
$\frac{1}{12}$
$\frac{1}{12}$

7 Multiply
2.395
100

8 $\frac{4}{5} \times \frac{1}{10} =$

9 $\frac{1}{2} =$ ____%

10 Subtract
$\frac{11}{12}$
$\cdot\ \frac{2}{3}$

11 Multiply
.038
.15

12 .05 = ____%

13 Subtract
5283.3862
741.6165

14 Multiply
386
340

15 30% of $15.00 =

16 13% = $\frac{\quad}{100}$

17 $\frac{6}{8} =$ ____%

18 Find the average
16 yd.
8 yd.
19 yd.
21 yd.

19 $\frac{1}{2} \div 6 =$

20 Add
300.829
765.987
693.005
45.955
5.215

Answer

1 ____
2 ____
3 ____
4 ____
5 ____
6 ____
7 ____
8 ____
9 ____ %
10 ____
11 ____
12 ____ %
13 ____
14 ____
15 $ ____
16 ____
17 ____
18 ____ yd.
19 ____
20 ____

Go right on to Example 21 on the next page.

21 Add

$11\frac{5}{6}$
$12\frac{1}{4}$
$16\frac{1}{6}$

22 $12\overline{)20405}$

23 Add

3 mo. 1 wk.
5 mo. 2 wk.
2 mo. 3 wk.

24 $5\frac{5}{6} \times \frac{9}{10} =$

25 $2\frac{1}{16} \div 1\frac{1}{10} =$

26 $.80\overline{).4}$

27 $32\overline{)16647}$

28 $271\overline{)153386}$

29 Selling price = \$750
Rate of commission = 6%
Commission = \$____

30 $.36\overline{)6.3}$

31 Subtract

3 lb. 2 oz.
1 lb. 4 oz.

32 $133\frac{1}{3}\%$ of \$15 =

33 Principal = \$800
Rate = 2%
Time = 6 mo.
Interest = \$____

34 Marked price = \$48
Discount = 25%
Net price = \$____

35 $4n = 36$
$n =$

36 $x + 7 = 18$
$x =$

37 Principal = \$100
Annual interest = \$4.50
Interest rate = ____%

38 $\frac{1}{2}\%$ of \$500 =

Answer

21 _____
22 _____
23 ___ mo. ___ wk.
24 _____
25 _____
26 _____
27 _____
28 _____
29 \$_____
30 _____
31 ___ lb. ___ oz.
32 \$_____
33 \$_____
34 \$_____
35 _____
36 _____
37 _____%
38 \$_____

Go right on to Example 39 on the next page.

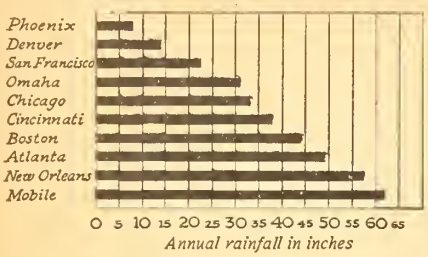


FIG. 1

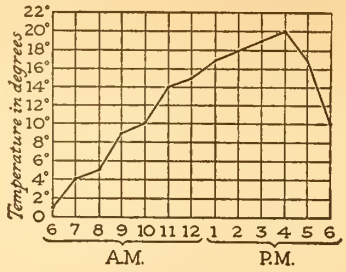


FIG. 2

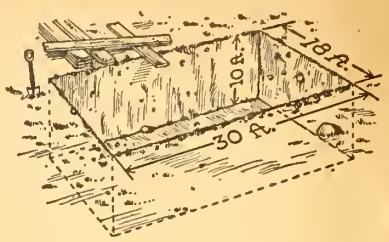


FIG. 3

39 What city has an annual rainfall of about 33 inches, as shown in Figure 1?

40 How many degrees did the temperature rise from 7 A.M. to 4 P.M., according to Figure 2?

41 How many cubic feet of earth were removed in digging the cellar shown in Figure 3?

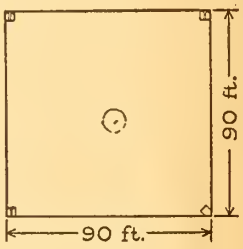


FIG. 4

42 What is the area of the baseball diamond in Figure 4 in *square yards?*

43 Assessed valuation = \$5000
Tax rate per \$100 = \$1.50
Amount of tax = \$_____

44 $x - 12 = 37$
$x =$

45 List price = \$400
Discounts = 25%; 5%
Net price = \$_____

46 $\sqrt{64} =$

47 Subtract
$+3$
-5

48 $2m + 12 = 36$
$m =$

49 \$20 = $66\frac{2}{3}$% of \$____

50 If 35% of a number is \$70, what is the number?

51 12 = ____% of 3

52 5 : 8 = 10 : ____

53 Add
-23
$+16$

54 $\frac{-16}{-2} =$

55 $\frac{g}{7} = 21$
$g =$

56 Multiply
$+2y$
-4

57 $2b - b - 2b =$

Go right on to Example 58 on the next page.

Answer	
39	
40	
41	cu. ft.
42	sq. yd.
43	\$
44	
45	\$
46	
47	
48	
49	\$
50	\$
51	%
52	
53	
54	
55	
56	
57	

Answer

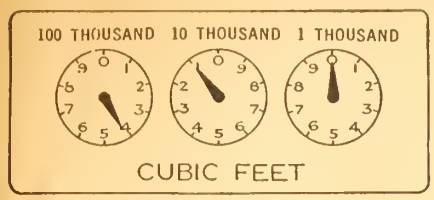


FIG. 5

58 What is the reading of the gas meter shown in Figure 5 in cubic feet? 58 _____ cu. ft.

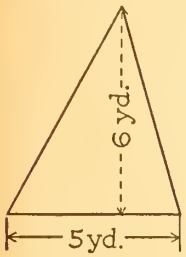


FIG. 6

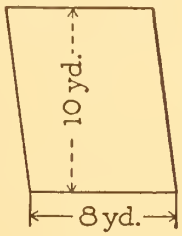


FIG. 7

59 Use the formula $A = \frac{1}{2}bh$ to find the area of the triangle shown in Figure 6. 59 _____ sq. yd.

60 Use the formula $A = bh$ to find the area of the parallelogram shown in Figure 7. 60 _____ sq. yd.

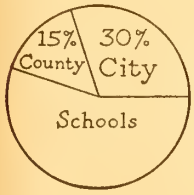


FIG. 8

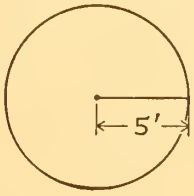


FIG. 9

61 What per cent of the city's budget went for schools, according to Figure 8? 61 _____ %

62 Use the formula $A = \pi r^2$ to find the area of the circle shown in Figure 9. (Use $\pi = 3.14$.) 62 _____ sq. ft.

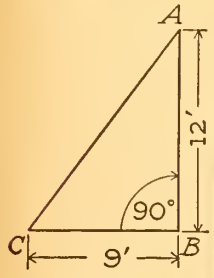


FIG. 10

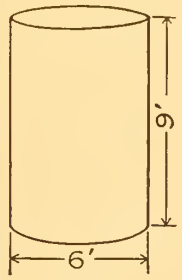


FIG. 11

63 Find AC, or the hypotenuse, of the right triangle shown in Figure 10. 63 _____ ft.

64 Find the volume of the cylinder shown in Figure 11. (Use $\pi = 3.14$.) 64 _____ cu. ft.

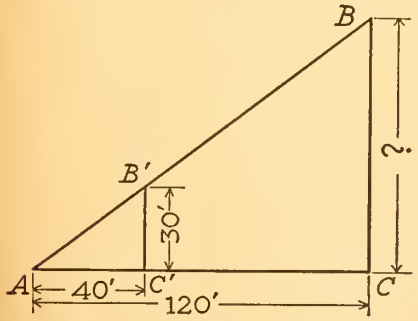


FIG. 12

65 Find the length of side BC in Figure 12, using the method of similar triangles. 65 _____ ft.

End of Test 5. Look over your work.

Number right	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
Equated score	41	42	43	44	45	46	47	48	49	50	51	52	52	53	54	55	56	57	58	59	60	61	62	63	63	64	65	66	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	80

44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
81	82	83	84	85	85	86	87	88	89	90	91	91	92	93	94	95	96	96	98	99	100

DIRECTIONS. In each exercise one of the three numbered answers is the best answer. Note the number of this answer. Then mark the answer space at the right which is numbered the same as the answer you have selected.

SAMPLES.

A The Bible is the name of a — 1 place 2 book 3 country . . . . . A 1 2 3

B Jack Spratt could eat no — 4 meat 5 bread 6 fat . . . . . B 4 5 6

1 "A Christmas Carol" was written by — 1 **Dickens** 2 **Thackeray** 3 **Wiggin** 1 1 2 3

2 A town along Paul Revere's route was — 4 **Portland** 5 **New York** 6 **Lexington** 2 4 5 6

3 The Forest in which Robin Hood lived was called — 7 **New Forest** 8 **Sherwood** 9 **Black** 3 7 8 9

4 One who looked upon the terrible Gorgon's head turned into a — 1 **tree** 2 **bird** 3 **stone** 4 1 2 3

5 Booker T. Washington was a — 4 **Negro** 5 **Jew** 6 **Indian** 5 4 5 6

6 Punch and Judy are — 7 **actors** 8 **elves** 9 **puppets** 6 7 8 9

7 Robert Louis Stevenson wrote — 1 "**Drums**" 2 "**Treasure Island**" 3 "**Little Captive Lad**" 7 1 2 3

8 The Norse God of Thunder was — 4 **Thor** 5 **Frey** 6 **Loki** 8 4 5 6

9 Ali Baba's brother was killed by — 7 **lions** 8 **thieves** 9 **Ali Baba** 9 7 8 9

10 Minnehaha is a character in — 1 "**Hiawatha**" 2 "**Chi-wee**" 3 "**Standing Bear**" 10 1 2 3

16→

11 Buffalo Bill's last name was — 4 **Kenton** 5 **Crockett** 6 **Cody** 11 4 5 6

12 The little shepherd of Provence was — 7 **deaf** 8 **lame** 9 **mute** 12 7 8 9

13 In Lowell's poem, Aladdin as a man no longer had his — 1 **lamp** 2 **wealth** 3 **health** 13 1 2 3

14 Nathaniel Hawthorne was a great — 4 **doctor** 5 **writer** 6 **judge** 14 4 5 6

15 Heidi loved to tend the goats with — 7 **Grandfather** 8 **Clara** 9 **Peter** 15 7 8 9

16 Sindbad is a character in — 1 "**Aladdin**" 2 "**The Arabian Nights**" 3 "**Robin Hood**" 16 1 2 3

17 One storyteller in "The Duel" is the — 4 **old Dutch clock** 5 **kitchen stove** 6 **blue teapot** 17 4 5 6

18 The Light Princess weighed as much as a — 7 **feather** 8 **bird** 9 **woman** 18 7 8 9

19 Richard the Lion-Hearted was king of — 1 **France** 2 **Germany** 3 **England** 19 1 2 3

20 The Great Stone Face was made by — 4 **machinery** 5 **nature** 6 **a sculptor** 20 4 5 6

21 The Selfish Giant shut the children out of his — 7 **house** 8 **library** 9 **garden** 21 7 8 9

22 Little Lord Fauntleroy went to live with his — 1 **grandfather** 2 **mother** 3 **uncle** . . . 22 1 2 3

23 Daniel Defoe wrote — 4 "**Billy Barnicoat**" 5 "**Gay Neck**" 6 "**Robinson Crusoe**" 23 4 5 6

24 Moni lived in the — 7 **mountains** 8 **forest** 9 **city** 24 7 8 9

Go right on to the next page.

Difference	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Equated score	33	34	35	36	37	38	40	41	42	44	46	48	49	50	52	54	55	56	57	59	60	62	64	66	68	70	72	74	75	77	79	81	82	83	84	86	87	88	90	91	92	93	94	95	96	97	99	100	100	101	101

25 Sherlock Holmes's friend was — 1 **Captain Mills** 2 **Dr. Watson** 3 **Mr. Jones** 25 1 2 3

26 "A Midsummer Night's Dream" is a — 4 **play** 5 **poem** 6 **song** 26 4 5 6

27 Mowgli lived in the — 7 **mountains** 8 **jungle** 9 **city** 27 7 8 9

28 Tom Chist and the parson dug up the — 1 **map** 2 **statue** 3 **chest** 28 1 2 3

29 Peter Pan came into Wendy's house through the — 4 **chimney** 5 **window** 6 **door** . . 29 4 5 6

30 "Slowcoach" is a story of — 7 **adventure** 8 **romance** 9 **mystery** 30 7 8 9

31 The man who visited Lilliput was — 1 **Gulliver** 2 **Mercury** 3 **Valjean** 31 1 2 3

32 Mrs. Wiggs was always — 4 **grumbling** 5 **scolding** 6 **cheerful** 32 4 5 6

33 The dog in "The Call of the Wild" was — 7 **Tim** 8 **Valor** 9 **Buck** 33 7 8 9

34 The man with the Golden Touch was — 1 **Midas** 2 **Perseus** 3 **Solomon** 34 1 2 3

35 Seven Peas in the Pod has a story for each — 4 **hour** 5 **day** 6 **week** 35 4 5 6

36 Dorcas and Heema caught fish with a — 7 **line** 8 **net** 9 **spear** 36 7 8 9

37 "Masterman Ready" is a story about a — 1 **revolution** 2 **shipwreck** 3 **murder** 37 1 2 3

38 Evangeline lived in — 4 **Acadia** 5 **Tuscany** 6 **Normandy** 38 4 5 6

17 →

39 "Invincible Louisa" is a story of — 7 **Mary Louise** 8 **Louisa May Alcott** 9 **Louisa Jane** 39 7 8 9

40 Nils was reduced to elfin size because of malicious — 1 **adventure** 2 **desire** 3 **mischief** 40 1 2 3

41 Aucassin loved — 4 **Nicolette** 5 **Juliet** 6 **Frances** 41 4 5 6

42 Shakespeare wrote — 7 **" The Piper "** 8 **" Julius Caesar "** 9 **" Treasure Island "** . . 42 7 8 9

43 Juan and Juanita were captured by — 1 **pirates** 2 **thieves** 3 **Comanche Indians** 43 1 2 3

44 Sinopah the Indian boy did not fear — 4 **gods** 5 **pain** 6 **the chief** 44 4 5 6

45 Ballor's son shod the silver — 7 **moose** 8 **donkey** 9 **unicorn** 45 7 8 9

46 Caedmon was an old English — 1 **monk** 2 **king** 3 **knight** 46 1 2 3

47 Lob-Lie-by-the-Fire was a — 4 **dog** 5 **Brownie** 6 **parrot** 47 4 5 6

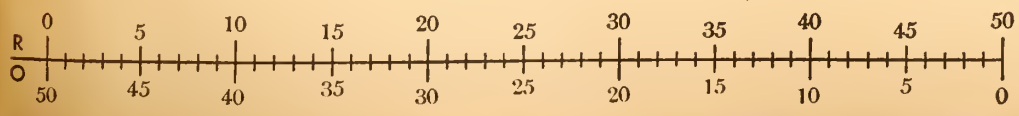
48 Araminta found a — 7 **baby** 8 **diamond** 9 **purse** 48 7 8 9

49 Oliver Twist was brought up in a — 1 **castle** 2 **workhouse** 3 **school** 49 1 2 3

50 "A Tale of Two Cities" was written by — 4 **Scott** 5 **Dickens** 6 **Thackeray** 50 4 5 6

End of Test 6. Look over your work.

No. right ( ) × 3 ( )
No. omitted ( )
Sum ( )
Sum ÷ 2 ( )
Subtract 25
Difference ( )



DIRECTIONS. In each exercise one of the three numbered answers is the best answer. Note the number of this answer. Then mark the answer space at the right which is numbered the same as the answer you have selected.

SAMPLES.

A The number of stripes in our flag is — 1 **six** 2 **seven** 3 **thirteen** ..... A 1 2 3

B Which of the following was an Indian? 4 **Hiawatha** 5 **Buffalo Bill** 6 **John Smith** ... B 4 5 6

1 Daniel Boone was a noted — 1 **statesman** 2 **pioneer** 3 **orator** 1 1 2

2 Most automobile accidents are due to — 4 **poor brakes** 5 **careless driving** 6 **wet streets** 2 4 5 6

3 The highest authority in a court is the — 7 **prosecutor** 8 **sheriff** 9 **judge** 3 7 8 9

4 Typical life in the Southern colonies was that of the — 1 **town** 2 **plantation** 3 **city** .. 4 1 2 3

5 The term of the President of the U. S. is — 4 **2 years** 5 **4 years** 6 **6 years** 5 4 5 6

6 Bad housing conditions in cities increase — 7 **living costs** 8 **taxes** 9 **disease** 6 7 8 9

7 The Puritans can best be described as — 1 **tolerant** 2 **meek** 3 **religious** 7 1 2 3

8 Which started first? 4 **Jamestown Colony** 5 **westward movement** 6 **Revolutionary War** 8 4 5 6

9 Robert E. Lee surrendered to — 7 **Grant** 8 **Sheridan** 9 **Sherman** 9 7 8 9

10 A dinosaur was a prehistoric — 1 **bird** 2 **reptile** 3 **fish** 10 1 2 3

18→

11 By the " Mistress of the Seas " was meant — 4 **Holland** 5 **Great Britain** 6 **United States** 11 4 5 6

12 The annexation of Texas brought on a war with — 7 **Spain** 8 **France** 9 **Mexico** 12 7 8 9

13 One of the ships of Columbus was the — 1 **Niña** 2 **Isabella** 3 **Juanita** 13 1 2 3

14 A country that long ago built wonderful roads was — 4 **Egypt** 5 **Germany** 6 **Rome** 14 4 5 6

15 The World War began in — 7 **1914** 8 **1916** 9 **1918** 15 7 8 9

16 The Ten Commandments were given to civilization by the — 1 **Hebrews** 2 **Greeks** 3 **Romans** 16 1 2 3

17 The power used in the first automobiles was — 4 **gasoline** 5 **steam** 6 **oil** 17 4 5 6

18 One of the earliest musical instruments was the — 7 **drum** 8 **banjo** 9 **violin** 18 7 8 9

19 The cliff dwellers got up into their houses by means of — 1 **ropes** 2 **ladders** 3 **steps** 19 1 2 3

20 Before 1600 most Europeans came to America to — 4 **settle** 5 **find riches** 6 **fight Indians** 20 4 5 6

21 The Monroe Doctrine forbids extension of colonies in — 7 **Africa** 8 **Asia** 9 **America** 21 7 8

22 Fifty years ago we had no — 1 **motion pictures** 2 **railroads** 3 **telephones** 22 1 2 3

23 The steam engine was greatly developed by — 4 **John Fitch** 5 **James Watt** 6 **Charles Duryea** 23 4 5 6

24 The Pueblo Indians are found in the — 7 **Atlantic states** 8 **Northeast** 9 **Southwest** 24 7 8 9

Go right on to the next page.

Difference	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Equated score	41	42	43	43	44	45	46	47	48	50	51	52	53	54	55	56	57	58	59	60	61	62	63	63	64	65	66	67	68	70	71	72	74	75	76	78	80	81	82	83	85	86	87	88	90	91	92	93	94	95	96

25 Hindenburg commanded the forces of — 1 **Great Britain** 2 **Russia** 3 **Germany** 25 (1 2 3)

26 Henry Clay was a great — 4 **merchant** 5 **inventor** 6 **statesman** 26 (4 5 6)

27 The doctrine of "free trade" concerns — 7 **imports** 8 **silver** 9 **right of speech** 27 (7 8 9)

28 Pershing commanded the forces of — 1 **Great Britain** 2 **the United States** 3 **France** 28 (1 2 3)

29 A Federal agency that insures bank deposits is the — 4 **FDIC** 5 **HOLC** 6 **WPA** 29 (4 5 6)

30 Extra sessions of Congress are called by the — 7 **President** 8 **people** 9 **Supreme Court** 30 (7 8 9)

31 Detroit, Michigan, was first settled by the — 1 **English** 2 **French** 3 **Spanish** 31 (1 2 3)

32 The Greek theaters were — 4 **very small** 5 **surrounded by high walls** 6 **open-air** 32 (4 5 6)

33 A famous Greek philosopher was — 7 **Confucius** 8 **Socrates** 9 **Cicero** 33 (7 8 9)

34 The laws passed by city councils are called — 1 **ordinances** 2 **franchises** 3 **charters** 34 (1 2 3)

35 At the battle of Marathon the Greeks fought the — 4 **Romans** 5 **Moors** 6 **Persians** 35 (4 5 6)

36 Supreme Court justices receive office by — 7 **election** 8 **appointment** 9 **inheritance** 36 (7 8 9)

37 Suffrage is the right of — 1 **voting** 2 **holding office** 3 **free speech** 37 (1 2 3)

38 The activities of the Smithsonian Institution are chiefly — 4 **legal** 5 **scientific** 6 **military** 38 (4 5 6)

19→

39 Dewey won a naval battle at — 7 **Vicksburg** 8 **Manila Bay** 9 **Santiago Harbor** . . . 39 (7 8 9)

40 The first operas were produced in — 1 **Italy** 2 **England** 3 **Germany** 40 (1 2 3)

41 The number killed by automobiles per year is about — 4 **2000** 5 **35,000** 6 **250,000** 41 (4 5 6)

42 About 700 A.D. most of Spain was conquered by the — 7 **Moors** 8 **Phœnicians** 9 **Romans** 42 (7 8 9)

43 In the election of 1864 Lincoln was opposed by — 1 **Stanton** 2 **Seward** 3 **McClellan** 43 (1 2 3)

44 A Mexican accused of raiding a U. S. town in 1916 was — 4 **Villa** 5 **Huerta** 6 **Obregon** 44 (4 5 6)

45 Which Federal Department issues passports? 7 **State** 8 **Treasury** 9 **War** 45 (7 8 9)

46 European government in the Middle Ages was — 1 **democratic** 2 **tribal** 3 **feudal** 46 (1 2 3)

47 Goethals reminds us of the — 4 **World War** 5 **airplane** 6 **Panama Canal** 47 (4 5 6)

48 U. S. Government building of roads began about — 7 **1776** 8 **1811** 9 **1875** 48 (7 8 9)

49 John Brown was a militant — 1 **pioneer** 2 **statesman** 3 **Abolitionist** 49 (1 2 3)

50 The art of printing was invented in — 4 **Egypt** 5 **Morocco** 6 **China** 50 (4 5 6)

End of Test 7. Look over your work.

No. right ( ) × 3	( )
No. omitted	( )
Sum	( )
Sum ÷ 2	( )
Subtract	25
Difference	( )

DIRECTIONS. In each exercise one of the three numbered answers is the best answer. Note the number of this answer. Then mark the answer space at the right which is numbered the same as the answer you have selected.

SAMPLES. A A day of the week is — 1 **January** 2 **Friday** 3 **summer** ..... A 1 2 3

B Which of the following is a city? 4 **Europe** 5 **Texas** 6 **Detroit** ..... B 4 5 6

1 Granite is a kind of — 1 **tree** 2 **rock** 3 **fruit** 1 1 2 3

2 A caravan might be — 4 **a camel train** 5 **an oasis** 6 **a koofah** 2 4 5 6

3 A country largely covered by an ice sheet is — 7 **Greenland** 8 **Australia** 9 **Canada** 3 7 8 9

4 The meat from a cow is called — 1 **mutton** 2 **pork** 3 **beef** 4 1 2 3

5 The Panama Canal Zone is controlled by — 4 **France** 5 **Mexico** 6 **the United States** 5 4 5 6

6 The homes of the frontiersmen were usually made of — 7 **adobe** 8 **stone** 9 **logs** 6 7 8 9

7 An important forest product is — 1 **turpentine** 2 **gasoline** 3 **glue** 7 1 2 3

8 Most of the United States is in the — 4 **Tropical Zone** 5 **Temperate Zone** 6 **Frigid Zone** 8 4 5 6

9 A common industry of mountain regions is — 7 **manufacturing** 8 **fishing** 9 **mining** 9 7 8 9

10 Much silk is produced in — 1 **China** 2 **Austria** 3 **Ireland** 10 1 2 3

20→

11 Decayed plants help to make soils — 4 **poorer** 5 **richer** 6 **heavier** 11 4 5 6

12 Longitude is measured in — 7 **inches** 8 **miles** 9 **degrees** 12 7 8 9

13 Which of the following does *not* come from trees? 1 **paper** 2 **cork** 3 **asbestos** 13 1 2 3

14 The mouth of the Nile River is located in — 4 **Egypt** 5 **Italy** 6 **Germany** 14 4 5 6

15 A country which stretches almost across two continents is — 7 **China** 8 **Russia** 9 **Canada** 15 7 8 9

16 The corn belt is in the — 1 **Middle West** 2 **South** 3 **Far West** 16 1 2 3

17 A gondola is a — 4 **weapon** 5 **boat** 6 **tool** 17 4 5 6

18 A country of mountains, lakes, and tunnels is — 7 **Denmark** 8 **Holland** 9 **Switzerland** 18 7 8 9

19 Milk heated to 143° for 30 minutes is called — 1 **Grade A** 2 **evaporated** 3 **pasteurized** 19 1 2 3

20 India is controlled by — 4 **France** 5 **Great Britain** 6 **Turkey** 20 4 5 6

21 A city noted for meat packing is — 7 **Philadelphia** 8 **San Francisco** 9 **Chicago** 21 7 8 9

22 The ocean surrounding the North Pole is the — 1 **Arctic** 2 **Indian** 3 **Antarctic** 22 1 2 3

23 The chief industrial region of the U. S. is the — 4 **South** 5 **Northeast** 6 **West** 23 4 5 6

24 Pygmies are found in — 7 **the Congo region** 8 **Alaska** 9 **Lapland** 24 7 8 9

Go right on to the next page.

Difference	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Equated score	39	40	41	41	42	42	43	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	58	59	60	61	62	63	64	65	66	68	70	72	74	75	76	78	79	80	82	83	84	86	87	88	89	90	91	92

25 The largest river in the Great Central Plain is the — 1 **Ohio** 2 **Mississippi** 3 **Rio Grande** 25 1 2 3

26 The city where every through passenger changes trains is — 4 **Chicago** 5 **Omaha** 6 **Albany** 26 4 5 6

27 London is situated on the — 7 **Thames** 8 **Severn** 9 **Clyde** 27 7 8 9

28 Helium gas comes chiefly from — 1 **Germany** 2 **France** 3 **the United States** 28 1 2 3

29 The North Star can be found easily by means of the — 4 **Little Dipper** 5 **Big Dipper** 6 **moon** 29 4 5 6

30 The leading crop of Puerto Rico is — 7 **sugar cane** 8 **bananas** 9 **coconuts** 30 7 8 9

31 The Great Central Plain of the U. S. produces chiefly — 1 **lumber** 2 **grain** 3 **vegetables** 31 1 2 3

32 The Congo region exports — 4 **cheese** 5 **ivory** 6 **meats** 32 4 5 6

33 Arabia is — 7 **an island** 8 **a peninsula** 9 **an isthmus** 33 7 8 9

34 One of the most common foods in Japan is — 1 **mutton** 2 **corn** 3 **fish** 34 1 2 3

35 In most South American countries people speak — 4 **Spanish** 5 **Portuguese** 6 **English** 35 4 5 6

36 Deltas are formed by — 7 **winds** 8 **ocean currents** 9 **rivers** 36 7 8 9

37 One of the greatest lumbering states is — 1 **Kansas** 2 **Illinois** 3 **Washington** 37 1 2 3

38 "The slag" in steel making is — 4 **waste** 5 **made into cement** 6 **pressed into bricks** 38 4 5 6

21 →

39 The Andes Mountains are located in — 7 **Switzerland** 8 **India** 9 **South America** . . . 39 7 8 9

40 The width of the United States is about — 1 **1000 miles** 2 **3000 miles** 3 **5000 miles** 40 1 2 3

41 Cumberland Gap formed a natural pass through the — 4 **Rockies** 5 **Appalachians** 6 **Sierras** 41 4 5 6

42 For which of these is England best suited? 7 **cattle** 8 **corn** 9 **tobacco** 42 7 8 9

43 A city that started as a fur-trading post was — 1 **Detroit** 2 **Providence** 3 **El Paso** 43 1 2 3

44 "Soft" coal is also called — 4 **lignite** 5 **bituminous** 6 **anthracite** 44 4 5 6

45 A crop little grown in Europe is — 7 **cotton** 8 **tobacco** 9 **oats** 45 7 8 9

46 Per day a tractor and a machine plow will plow about — 1 **an acre** 2 **100 acres** 3 **12 acres** 46 1 2 3

47 The summer monsoons of China are — 4 **wet winds** 5 **dry winds** 6 **dusty winds** . . . 47 4 5 6

48 The North Pole was first reached in — 7 **1850** 8 **1909** 9 **1929** 48 7 8 9

49 Many Eastern cities were started — 1 **on lakes** 2 **at river falls** 3 **in mountains** 49 1 2 3

50 The fastest ocean ships are driven by — 4 **electricity** 5 **gas engines** 6 **steam turbines** 50 4 5 6

End of Test 8. Look over your work.

No. right ( ) × 3 ( )
No. omitted ( )
Sum ( )
Sum ÷ 2 ( )
Subtract 25
Difference ( )

DIRECTIONS. In each exercise one of the three numbered answers is the best answer. Note the number of this answer. Then mark the answer space at the right which is numbered the same as the answer you have selected.

SAMPLES.

A Horses have — 1 feathers 2 hair 3 scales ..... A 1 2 3

B Which of the following is very heavy? 4 cotton 5 cake 6 iron ..... B 4 5 6

1 The bean belongs to the same family as the — 1 turnip 2 pea 3 corn 1 1 2 3

2 How often should you change handkerchiefs? 4 daily 5 weekly 6 monthly 2 4 5 6

3 Most fish are covered with — 7 barbs 8 shells 9 scales 3 7 8 9

4 If you see a fallen electric wire, you should — 1 report it 2 replace it 3 pick it up 4 1 2 3

5 A baby frog is called a — 4 minnow 5 wriggler 6 tadpole 5 4 5 6

6 Seeds that we eat are — 7 onions 8 peas 9 carrots 6 7 8 9

7 The body gets its oxygen from — 1 water 2 food 3 air 7 1 2 3

8 A good cheap tooth cleaner is — 4 pumice 5 salt 6 sulphur 8 4 5 6

9 All disease germs may be killed by — 7 boiling 8 freezing 9 soap 9 7 8 9

10 Flies breed chiefly in — 1 water 2 filth 3 milk 10 1 2 3

22→

11 When you face north, your right hand is toward the — 4 east 5 west 6 south 11 4 5 6

12 The best soil for growing most plants is — 7 clay 8 sand 9 loam 12 7 8 9

13 The "telephone system" of the body is the — 1 nerves 2 blood vessels 3 muscles 13 1 2 3

14 In winter bedroom windows should be — 4 kept closed 5 opened at the top 6 opened wide 14 4 5 6

15 A good stimulant for a fainting person is — 7 ammonia water 8 opium 9 chloroform 15 7 8 9

16 An animal that cares for its young for several years is the — 1 tiger 2 wolf 3 elephant 16 1 2 3

17 A machine that produces electricity is called a — 4 transformer 5 rheostat 6 generator 17 4 5 6

18 Which of these animals has the shortest neck? 7 giraffe 8 elephant 9 horse 18 7 8 9

19 Muscle action is controlled by the — 1 bones 2 blood vessels 3 nerves 19 1 2 3

20 Burns may often be relieved by — 4 alcohol 5 olive oil 6 ammonia 20 4 5 6

21 Important discoveries about bacteria were made by — 7 Pasteur 8 Mayo 9 Newton 21 7 8 9

22 Decay of the teeth may be caused by — 1 alcohol 2 bacteria 3 tobacco 22 1 2 3

23 Digestion is retarded by — 4 rapid eating 5 the use of salt 6 good humor 23 4 5 6

24 An animal that sleeps in the mud all winter is the — 7 beaver 8 seal 9 turtle 24 7 8 9

Go right on to the next page.

Difference	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Equated score	38	39	40	41	42	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	65	66	67	68	69	70	72	73	74	75	77	78	78	79	80	82	83	84	85	86	87	88	89	90	91	92

25 When a bird goes South in the winter we say it — 1 **migrates** 2 **molts** 3 **hibernates** 25 (1 2 3)

26 A food rich in both minerals and vitamins is — 4 **pie** 5 **cocoa** 6 **lettuce** 26 (4 5 6)

27 Combustion is another name for — 7 **boiling** 8 **burning** 9 **melting** 27 (7 8 9)

28 The common house thermometer was invented by — 1 **Galileo** 2 **Franklin** 3 **Fahrenheit** 28 (1 2 3)

29 There is a bare chance that life exists on — 4 **the moon** 5 **Mars** 6 **the sun** 29 (4 5 6)

30 Cells obtain their energy from — 7 **food** 8 **exercise** 9 **carbon dioxide** 30 (7 8 9)

31 Hot springs that spout water to great heights are — 1 **aqueducts** 2 **geysers** 3 **artesian wells** 31 (1 2 3)

32 Radium was discovered by — 4 **Marconi** 5 **Einstein** 6 **Curie** 32 (4 5 6)

33 A good insulating material for electric wires is — 7 **copper** 8 **silver** 9 **rubber** 33 (7 8 9)

34 Alcohol is a good anti-freeze because it — 1 **evaporates** 2 **burns** 3 **has a low freezing point** 34 (1 2 3)

35 A body that shines by reflected light is the — 4 **moon** 5 **North Star** 6 **sun** 35 (4 5 6)

36 An example of a one-celled animal is the — 7 **fly** 8 **amoeba** 9 **frog** 36 (7 8 9)

37 A common tool that is *not* a lever is the — 1 **file** 2 **pliers** 3 **scissors** 37 (1 2 3)

38 Perennials are plants that live — 4 **a few months** 5 **one year** 6 **a number of years** 38 (4 5 6)

23➜

39 An animal that swims backward is the — 7 **crayfish** 8 **snail** 9 **flounder** 39 (7 8 9)

40 The Audubon Society has done much to preserve — 1 **forests** 2 **wild life** 3 **minerals** 40 (1 2 3)

41 Light may be broken into many colors by a — 4 **light meter** 5 **telescope** 6 **prism** 41 (4 5 6)

42 The greatest labor-saving device ever discovered is the — 7 **plow** 8 **wheel** 9 **hammer** 42 (7 8 9)

43 The action of the lungs is something like a — 1 **lever** 2 **pump** 3 **bellows** 43 (1 2 3)

44 An example of an inorganic object is a — 4 **tree** 5 **rock** 6 **toad** 44 (4 5 6)

45 As air is warmed its capacity to absorb moisture — 7 **increases** 8 **remains constant** 9 **decreases** 45 (7 8 9)

46 A plant that is commonly grafted is the — 1 **apple tree** 2 **lily** 3 **potato** 46 (1 2 3)

47 The cactus can live on deserts because it — 4 **needs no water** 5 **is spiny** 6 **stores water** 47 (4 5 6)

48 Messages are sent by electric waves without wires by — 7 **cable** 8 **radio** 9 **telegraph** 48 (7 8 9)

49 The wild rose has — 1 **single blossoms** 2 **double blossoms** 3 **flowers with seven petals** 49 (1 2 3)

50 The mole lives on — 4 **insects** 5 **grass** 6 **soil** 50 (4 5 6)

End of Test 9. Look over your work.

No. right ( ) × 3	( )
No. omitted	( )
Sum	( )
Sum ÷ 2	( )
Subtract	25
Difference	( )

1 _____

2 _____

3 _____

4 _____

5 _____

6 _____

7 _____

8 _____

9 _____

10 _____

11 _____

12 _____

13 _____

14 _____

15 _____

16 _____

17 _____

18 _____

19 _____

20 _____

21 _____

22 _____

23 _____

24 _____

25 _____

26 _____

27 _____

28 _____

29 _____

30 _____

31 _____

32 _____

33 _____

34 _____

35 _____

36 _____

37 _____

38 _____

39 _____

40 _____

41 _____

42 _____

43 _____

44 _____

45 _____

46 _____

47 _____

48 _____

49 _____

50 _____

Grade 7

Number right	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Equated score	39	40	40	41	42	43	44	45	46	46	47	47	48	48	49	50	51	51	52	53	54	55	55	56	57	57	58	59	59	60	61	62	62	63	64	65	65	66	67	68	69	70	71	73	74	75	77	79	82	85	88

Grades 8 and 9

Number right	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Equated score	40	42	44	45	47	48	49	50	51	52	53	53	54	55	55	56	57	57	58	59	60	61	61	62	62	63	63	64	64	65	66	66	67	68	68	69	69	70	71	72	73	74	76	77	78	79	81	83	85	88	91